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R. H. STINCHFIELD, *Editor*

Editorial Office: 1102 16th Street, N. W., Washington 6, D. C.

VOLUME XXXVI NO. 2

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Softening Up!

Better Crops with PLANT FOOD

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VOL. XXXVI WASHINGTON, D. C., FEBRUARY 1952 No. 2

We will fill . . .

That Fifth Plate

Jeff McDermid

THAT record-breaking baby crop of 1951 presented an obstetric object lesson to our efficient agriculture. What will more such layettes do to the layout of farm plans in the next 25 years? Can we expect old Doc Stork to keep on flying in the face of Malthus? At the present population rate of increase—which is 250 newborn persons every hour—the food factory of our land must be geared up to provide victuals of current sustaining kinds to feed 38 million more hungry citizens within the ensuing 25 years.

On the face of it, this looks fine as far as markets for farm products are concerned. It also squares to the dot with the age-old hankering of our farmers to outdo themselves each succeeding season. Dilatory and lazy tactics by farm workers were as bad as the mule that dragged his hoofs and hung back in the collar. High production was the sign-manual of agriculture—maybe a throwback from the edict of Eden, when Grandpaw Adam quit feeding snakes and began raising Cain. But his descendants have not always found that large and luscious crops paid out as regularly as the copybooks claimed. In spite of all the sod-busting, land-clearing, and swamp-draining dither going on, the sum total of the bumper yields often made misery, lower living standards, and deeper debts for the producer thereof.

All of which simply means that plenty of reasonable outlook for firm farm prices and some profit must get into the dream picture to induce the farmer to get into a lather and jerk himself a hernia for the glory of the

public groceries. He's been bitten before by the gnats and ticks of sagging farm prices, accompanied by the irksome tax and interest payments staring him in the face. He loves his country, but not quite that much, it seems.

The farmer knows that high-level production is not an end in itself. (Not even if it's well paid for.) It is only one means of achievement of a better way of living. Farms and farmers both wear out fast and wrinkles appear on the faces of both in a surprisingly short length of time. Increased efficiency that makes high production possible means less hard work and probably less drain on men and lands. It should leave more time for better things—some of the better things that our folks down in the old valley used to read about but never saw.

HIGH production is a snide and a snare unless its advent brings some or all of such things as these to the farmers: (1) slackening the terrific pace of farm work and increasing the chances for rest and recreation for the whole family; (2) investing increased earnings in education, health, and home conveniences; (3) refraining from merely capitalizing increased farm earnings into higher and higher land values, which roll on and sink the enterprise and its profit opportunity for future generations.

In other words, given an incentive of stability in farm incomes plus all the tools and devices and materials needed to sustain that proposed push for production, the end result is not just stomach stuffing—but mental and spiritual rewards as well. When we count statistical babies and reckon how much farmers must "giddap" to raise them, let's be sure the country is going to be worth living in 25 years ahead. Having established and agreed fairly enough on such a goal where more babies will be welcome and have a fair chance, and where the food to sustain them and keep away pellagra won't be cheapened to the vanishing point—then we can proceed with the thesis of that fifth plate.

This fifth plate is a new way our farm leaders have chosen to get us set on a mark for a 25-year race against malnutrition and hunger on the one hand, and short supplies and costly foods on the other.

The noise of 2 million bawling new infants per year must be drowned out easily by the buzzing tractors and mooing cattle with which the farms must feed them. The projection made of coming years' populations here by the Bureau of Agricultural Economics foots to a total of over 200 million inhabitants of Uncle Sam's acres in 1975.

TO make it understandable, the chart book points out that the 38 million or more extra mouths to feed would equal all of the persons now living in the populous Northeastern states, or 18 Western states, or all the states of Dixieland, or the 8 famous farm states of Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Missouri, and Minnesota.

This means that for every four people who draw up to the dining table in 1950 there will be another extra person to fill a plate for in 1975. The farmer's job is to fill that fifth plate. But while food consumers are bound to increase in the next 25 years, the outlook is slim for any real increase in the farm population who will be relied upon to supply the meals in 1975.

Next the chart book goes into the required extra foods that such a higher population would need—but without figuring any improvement in the diets or the amounts per capita over the food consumed by our people in 1950. It is tabulated simply on the estimated consumption rates of a year or so ago, applied to the estimated consumers to be fed 25 years ahead.

From the butcher shop must come 5½ billion more pounds of the red meats—beef, pork, mutton, and lamb. That amount means the use of 10 million more cattle and calves, 20 million

extra hogs, and over 3 million more sheep and lambs than we need today at our customary rates. To support such a drove of new livestock for slaughter we must maintain about 100 million cattle, have annual pig crops of 121 million—even more than our best previous year of 1944—and 30 to 38 million more stock sheep in our flocks. All these added animal mouths to feed brings in the feed crop raiser and the agronomist with better-bred, high-yield strains.

Such a gain in livestock to get the

5½ billion pounds of extra meats equals the 1950 pig crops of Iowa and Nebraska, plus the cow numbers of Oklahoma, Texas, and Minnesota, plus the 1950 lamb crops of Montana, Wyoming, Utah, and Nevada together. It's a gigantic job for the best minds and abilities of the livestock industry—but given the right incentives, it will be met.

Poultry meat and egg protein afford elastic production to stretch our resources beyond the red meat supplies. By 1975 they claim we will need at least 14.7 billion more eggs if we maintain the 1950 consumption rate, on paper, of 395 eggs apiece. Such a per capita level would astonish old England, whose inhabitants are always shy of fresh shell eggs, and are none too happy on the powdered egg ration. Anyhow, this extra avalanche of crates holding 14.7 billion eggs to fill that table with five plates satisfactorily equals the present egg-laying power of California, Kansas, Missouri, Illinois, and Pennsylvania.

America is becoming fonder of milk and milk products. The most milk our dairy cows have ever given down was 60 billion pounds. But by 1975 the volume needed will be over 70 billion pounds. The added lactic fluid for all the fluid milk, cheese, butter, ice cream, and canned milk we can eat in 1975 will take the 1950 output of three famous leading dairy states—Wisconsin, Michigan, and New York.

IT should be observed by advancemen of the coming age of fabulous farming that exports of some grains and storable products will also need to be accounted for while we are taking care of our own enormous appetites. The world is largely a rural one and most of its workers are farmers, in one way or another. Yet the abundance of America still is looked to with yearning. Many half-starved foreign peoples expect us to share with them. But in accomplishing that extra production stint we'll need to be mindful of our manners, and not refuse to allow a few random competing food imports to be admitted here. Two of our major non-food export crops are cotton and tobacco. Selfish barriers to maintain firm home markets for certain foods are not a good way to instill domestic tranquility or foreign admiration.

About a fifth more total farm commodity production will be required in 1975 to feed our consumers well. A yearly rate of increase from now to 1975 which just about equals the yearly increases for the last five years is in the cards. A scant portion of that increase would come from new cropland put into production—the rest from better farm management methods.

In 1951 it is said that we produced about 40 per cent over what we did in the average pre-war years of 1935-39. The 1952 goals which have been widely promulgated call for 49 per cent

(*Turn to page* 48)

Potash Needs Move West

By George E. Smith

Department of Soils, University of Missouri, Columbia, Missouri

MIDWESTERN soils are showing an increased need for potash. Early fertilizer experiments gave little response from applications of potassium on many soils, although phosphorus, nitrogen, and calcium produced significant increases in crop yield. A detailed study of the minerals in these soils furnishes an explanation for this difference in response.

The silt fraction of most of the fertile soils of the Midwest contains potash minerals in quantities that should furnish adequate amounts of the element for many years. Phosphorus levels were not so universally high and exploitive. Cropping rapidly depleted supplies of organic matter. The increased use of nitrogen, phosphorus, and lime resulting in greater crop yields, together with changes in crop and soil management practices, is now making the addition of potassium necessary on an increasing number of farms if maximum crop yields are to be maintained. Summaries of thousands of soil tests show that in some sections of the Cornbelt from 40-60 per cent of the soils are showing levels of potash that are limiting crop yields. Results of numerous experiments and farm demonstrations confirm these laboratory tests.

Early Practices

Superphosphate applied with the fall seeding of small grains was the first fertilizer practice that came into general use in this area. Nitrogen deficiency symptoms were then observed on various crops. Nitrogen was added to the superphosphate to make a mixed fertilizer, containing nitrogen and phosphorus. Most emphasis, however, was placed on securing this nitrogen through the use of more legumes. Limestone was necessary for the legumes to make satisfactory growth, and lime and legume programs were promoted.

For some years the use of phosphorus, lime, and legumes produced higher yields, but on the lower fertility soils yields declined. Later it became increasingly difficult to obtain stands

TABLE I.—NUTRIENT CONTENT OF CROPS

(Based on specific yields per acre)

Crop	N lbs.	P_2O_5 lbs.	K_2O lbs.
Corn			
60 Bu. Grain	57	23	15
2 T. Stover	38	12	55
Total	95	35	70
Oats			
50 Bu. Grain	35	15	10
1.25 T. Straw	15	5	35
Total	50	20	45
Wheat			
30 Bu. Grain	35	16	9
1.25 T. Straw	15	4	21
Total	50	20	30
Soybeans			
25 Bu. Grain	110	35	40
1.25 T. Straw	15	5	20
Total	125	40	60
Alfalfa 3 T.	140	35	135
Red clover 2 T.	80	20	70
Lespedeza 2 T.	87	20	47

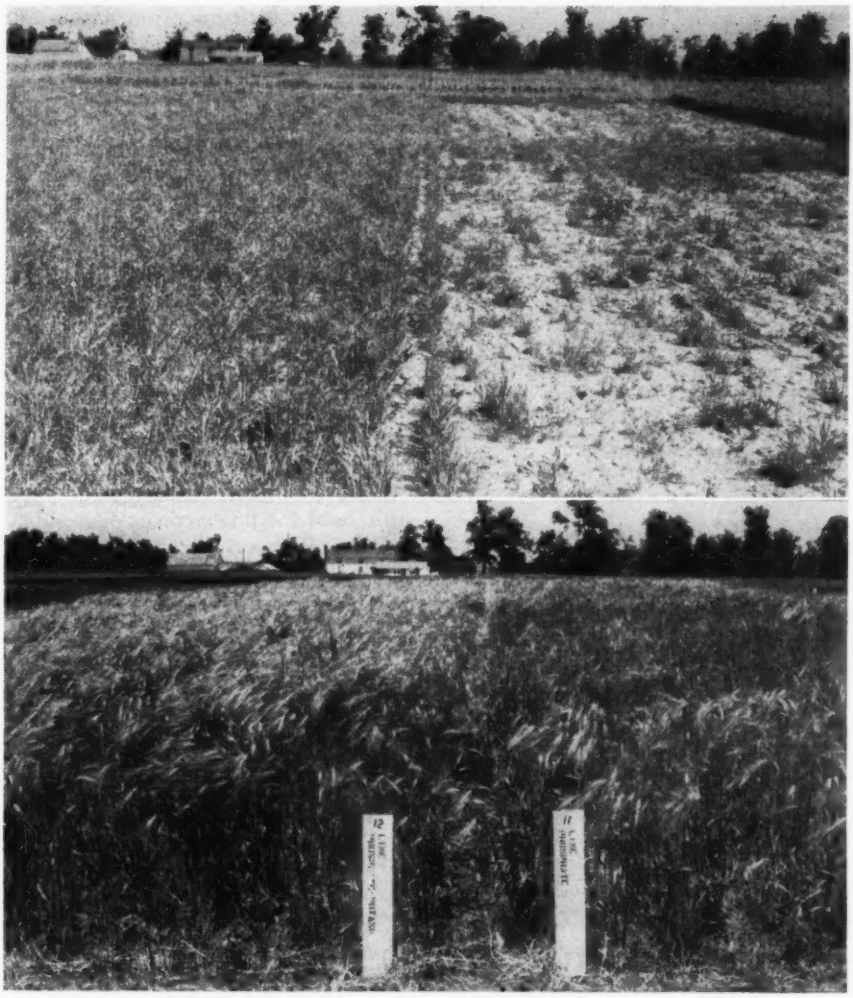

Fig. 1. Potash starvation of barley: (left) adequate minerals; (right) low potash. Top picture shows early spring condition and bottom picture just before harvest.

of legumes on the better soils, and the production of grain crops dropped. For a few years following the application of limestone the available potassium in the soil was temporarily increased. Heavy applications of limestone, particularly where the soil reaction was raised to near neutrality, have reduced the rate of weathering of the potassium minerals in these high exchange capacity soils and after a period of years available potassium has greatly declined.

The increased yields of crops have removed the potassium at a much more rapid rate. Greater frequency of legumes in the cropping system has introduced a crop of much higher potassium requirements than the grains that were formerly grown. It is now known that before the adoption of this management program soils could deliver sufficient potassium for the yields obtained, but with increased use of nitrogen and phosphorus and greater yields the delivery of potassium from the soil

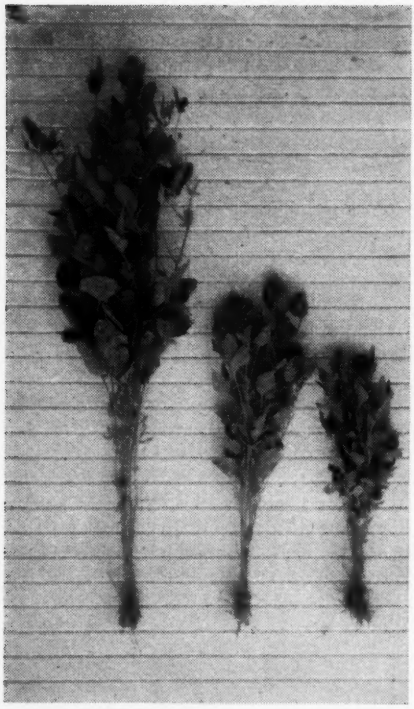

Fig. 2. Ten representative soybean plants from soil receiving: (left) lime, phosphate, and potash; (center) lime and phosphate; (right) lime.

is inadequate.

Legume crops for hay or forage are the most depleting of soil minerals of any crops grown. This high mineral requirement of legumes on fertile soils is frequently overlooked and the effect of the nitrogen added can overshadow the minerals being removed, until the level of these minerals is so low as to limit crop yields.

Most grains have a low potassium content. When only the grain is harvested and the straw or stover is returned, the amount of potash removed from the soil is low. Alfalfa, however, removes about 45 pounds and red clover 35 pounds of K_2O for each ton of hay produced. These figures explain why the soil level of potassium drops when legume forage is removed, and why some of the Midwestern soil management systems require potash in the fertilizers while others show little need for this element.

On a Putnam silt loam soil limed to a pH of 6.4, a rotation of corn, oats, wheat and sweet clover, with the sweet clover turned under and only the grain and small grain straw removed, shows an exchangeable potassium level of 150 pounds per acre after 14 years of cropping. In the same experiment where the cropping system is corn, wheat, red clover, and all grain and forage removed, the exchangeable potassium is only 72 pounds per acre. The crop response to potassium in the fertilizer shows close agreement with the soil tests.

TABLE II.—CROP RESPONSE TO POTASH

Rotation	Soil Treatment	Crop Yields							
		Corn		Oats		Wheat		Hay	
		14 Yr. Av.	1950	14 Yr. Av.	1950	14 Yr. Av.	1950	14 Yr. Av.	1950
Corn, oats, wheat, sweet clover (under)	L.	63.2	70.5	34.8	60.6	25.1	28.0	.....	.....
	LP*	68.7	73.7	42.7	70.6	30.1	39.6	.....	.....
	LPK**	67.7	72.4	43.6	77.5	30.7	41.0	.....	.....
Corn, wheat, red clover (Hay)	L	52.6	79.8	.....	.....	24.2	23.7	2,834	3,320
	LP*	57.2	84.3	.....	.....	27.6	25.0	3,147	3,380
	LPK**	63.7	105.5	.....	.....	29.4	29.0	3,512	3,780

* 0-20-0 @ 150 lbs. on corn, wheat, and oats.
** 0-20-20 @ 150 lbs. on corn, wheat, and oats.

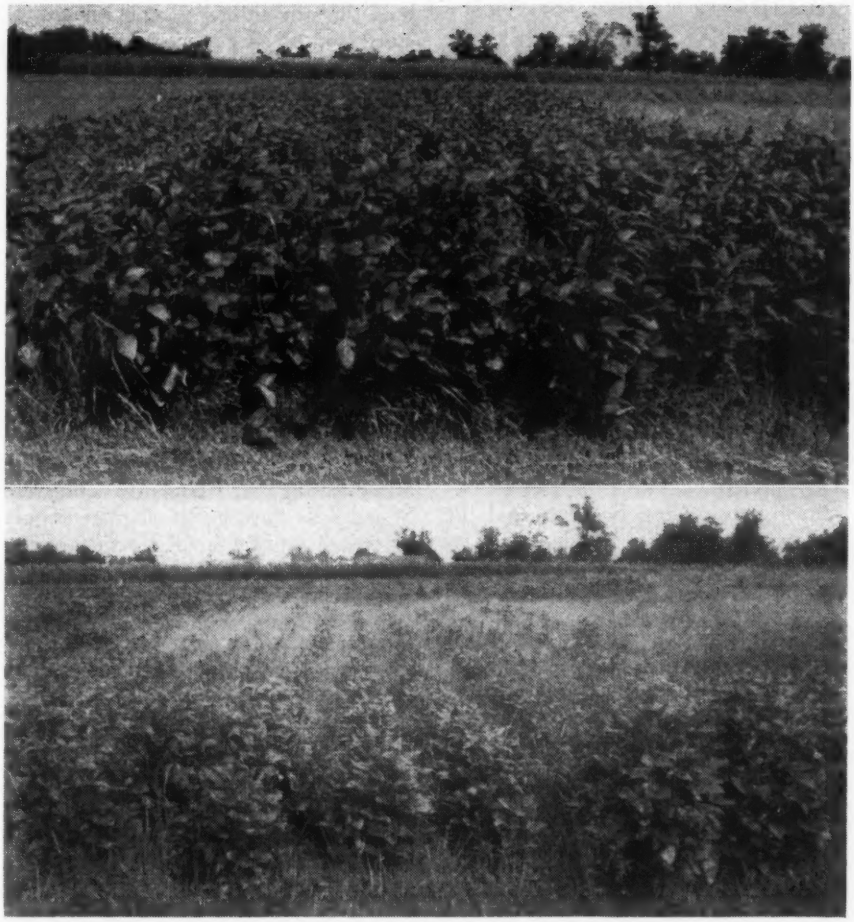

Fig. 3. Top—soybeans on soil receiving lime, phosphate, and potash. Exchangeable potash 244 pounds per acre.
Bottom—soybeans on soil receiving lime and phosphate. Exchangeable potash 104 pounds per acre.

Where sweet clover has been turned under for the past 14 years and the soil test indicated 150 pounds of available potassium, little increase of yield in grain crops in the rotation is obtained from the addition of potassium. Where red clover is used for hay, potassium in the fertilizer produces significant increases in the yield of both corn and wheat. It is becoming increasingly difficult to obtain stands of red clover when no potash is added.

In another experiment the available potash had been greatly reduced through the removal of small grain and lespedeza for hay. The cropping system was changed to include corn. It was evident that where adequate phosphorus had been applied in the past, the potassium level was lower than where no phosphate had been added.

In this particular experiment the soil tested 200 pounds of exchangeable potash and produced 70 bushels more corn per acre than an adjoining area where the tests indicated 88 pounds of this nutrient. Only 3 per cent of the stalks lodged at the higher nutrient level, while 49 per cent lodged to

TABLE III.—CORN—1950—PREVIOUSLY CROPPED TO SMALL GRAIN AND LESPEDEZA

Treatment	Exch. potash lbs per acre	Corn yield bu. per acre	% lodging
LN	96	67.0	10.5
LNP	88	48.5	49.0
LNPK	200	118.5	2.5

an extent that they might have been missed by a mechanical corn picker. Similar results are being obtained on many other soils where large quantities of nitrogen and phosphorus have been applied.

Previous cropping has extracted the available potassium to a sufficiently low level that the addition of potash greatly aided in securing a stand of legume. It is frequently found that where legume stands have failed, the soil test will show an inadequate content of available potassium. These results are obtained on soils where 10-15 years ago it was necessary to conduct carefully replicated experiments in order to demonstrate any response to potassium. Farmers are observing similar differences in their own fields, and soil tests can give a reliable indication where the application of this element will be profitable.

TABLE IV.—SOYBEAN YIELDS—1950—PUTNAM SILT LOAM

Treatment	Exch. potash, pounds per acre	Yield soybean hay
L	88	4,280
LP	104	5,260
LPK	240	7,020

One of the most spectacular effects of the added potassium is on small grains where a reduction of loss from winterkilling is frequently observed. When soils have an inadequate supply of potash, only a small fraction of the plants may survive the winter. "Winter starvation" might be a more descriptive term than winterkilling. Barley is particularly sensitive. In some fields this "starvation" has resulted in yields of less than 5 bushels per acre, while with adequate soil treatments the yields have been well over 30 bushels.

Not only is the addition of potash to Midwest soils influencing yield but the quality and general plant vigor are

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Fig. 4. Fall condition of cornstalks: (left) complete treatment, 3% lodged; (right) low potash, 49% lodged. Corn in sacks is harvested from one-twentieth acre: (left) complete treatment; (center) no potash; (right) no phosphorus or potash.

Boron for Forage Crops

By R. E. Blaser

Agronomy Department, Virginia Polytechnic Institute, Blacksburg, Virginia

THE yields and quality of many crops in Virginia are limited because of the low boron content in the soils.[1] Experimental work done by the Virginia Truck Crop Experiment Station showed that some 16 vegetable crops responded in additional growth when the soil was supplemented with borax. Research results obtained by the Virginia Agricultural Experiment Station during the past 10 to 15 years show that alfalfa stands often degenerate quickly, become infested with weeds, and are low in yield and quality of herbage unless the soils are supplemented with borax. The yield and quality of tobacco have also been improved by light applications of boron.

When alfalfa is grown on Virginia soils which are deficient in boron, the alfalfa plants are yellowish (boron deficient), produce low yields, and recover slowly after they are cut for hay. Low levels of boron in the soil affect the growth and quality of the alfalfa crops more during the summer than in spring. It is generally known that greater responses from boron are obtained during dry years than in wet years. The larger responses in growth in the summer as compared to the spring season apparently are associated with dry weather conditions during summer.

The comparative yields of alfalfa due to boron fertilization during the summer and spring season are given in Fig. 1. Boron applications increased the yields during the spring by 25 per cent as compared with an 80 per cent yield increase for the first aftermath

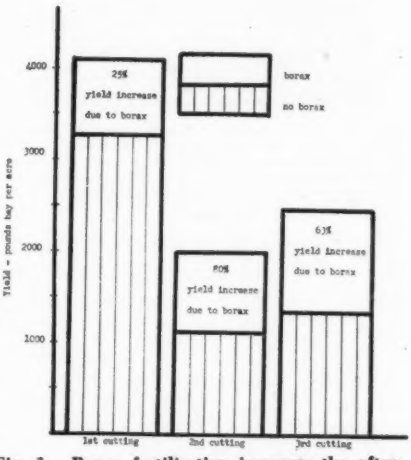

Fig. 1. Boron fertilization increases the aftermath growth of alfalfa during the drier summer periods more than during the spring season.

growth and a 63 per cent yield increase for the second aftermath growth. This influence of boron on aftermath growth of alfalfa has much practical value. For example, rapid aftermath recovery of alfalfa is very important for maintaining stands. Annual grasses and weeds such as crabgrass germinate in early summer. If the aftermath growth of alfalfa is rapid, weed seedlings are shaded out, hence, the stands of alfalfa may be maintained in a productive condition for longer periods when treated with borax.

The amount of summer feed for grazing is very important to the livestock farmer. In Virginia, pasture and hay crops produce more feed during the spring months than in any other season. The seasonal growth of a bluegrass-white clover mixture is given in Fig. 2. It is also known that milk

[1] Most of this report is based on data published in annual reports and bulletins of the Virginia Agricultural Experiment Stations.

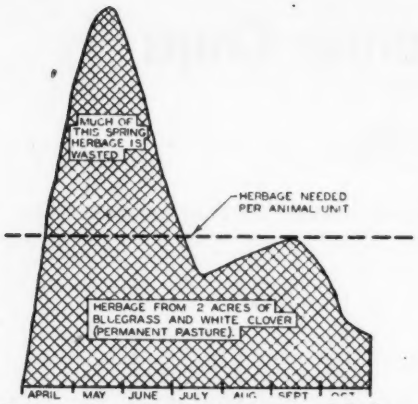

Fig. 2. The seasonal distribution of herbage from white clover-bluegrass pastures. Some of the herbage produced in the spring should be reserved for summer grazing, but with light stocking much of the herbage is wasted.

cows produce more milk per day and that steers gain more weight per day when they graze the spring herbage than the summer herbage. Steers gained 2.6 to 4.0 pounds per day in spring as compared with 1.2 to 1.8 pounds during the drier summer months, Table I. This high rate of daily gain during early season is partly related to the large supply of succulent feed during the spring as compared with the amount and quality of summer feed. If aftermath growth of alfalfa is used for grazing during the summer months, it is possible that a high productive rate of livestock or livestock products may be maintained.

Alfalfa has been used primarily in pure stands for hay. It is believed that alfalfa will be used more and more with other grass and legume mixtures in the future. If alfalfa is used in mixtures it can be managed flexibly and used for hay, silage, and supplementary grazing. Bloat is known to be very hazardous when grazing pure stands of alfalfa, but this problem is largely eliminated when using alfalfa-grass mixtures.

The dry weather conditions experienced in Virginia during the past season show that alfalfa-grass mixtures were more productive than ladino clover, birdsfoot trefoil, or lespedeza during the summer months. Alfalfa-grass mixtures might also be used for supplementary grazing in place of temporary summer-grazing crops such as sudan grass and millet.

Research with pasture and hay crop mixtures shows that alfalfa can be used to increase the yields, Table II. For a mixture of ladino clover-orchard grass sown in August, the yield during the spring was 657 pounds of herbage as compared with a yield of 1,825 pounds for a mixture of alfalfa-ladino clover-orchard grass. In addition to this there were about 10 times as many weeds in the orchard-ladino clover as in the alfalfa-orchard-ladino clover mixture. Other work shows that the addition of red clover to a ladino clover-orchard grass mixture will result in increased yields the first year. The results given in Table II show that a mixture of alfalfa-orchard grass produced slightly higher yields than alfalfa grown alone. The weed growth was higher in the pure alfalfa when com-

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TABLE I.—THE AVERAGE DAILY RATE OF GAIN OF STEERS GRAZING BLUEGRASS-WHITE CLOVER PASTURES AT GLADE SPRING, VIRGINIA.[1]

Average gains for 28-day periods, 1936–1942

April 16 to May 14	May 14 to June 11	June 11 to July 9	July 9 to Aug. 6	Aug. 6 to Sept. 3	Sept. 3 to Oct. 1	Oct. 1 to Oct. 29
4.0	2.6	1.8	1.2	1.7	1.9	1.1

[1] Data from R. C. Carter and C. M. Kincaid, "Seasonal variations in rate of gain of beef steers on pasture." Paper presented at the Annual Meeting of Southern Agricultural Workers, Biloxi, Mississippi, 1950.

LADINO CLOVER

Its Mineral Requirements and Chemical Composition*

By Ivan Stewart, Research Fellow, and Firman E. Bear, Research Specialist, Soils

Soils Department, Agricultural Experiment Station, New Brunswick, New Jersey

Mineral Content of Ladino Important to Consuming Animal

The mineral requirements of animals vary widely, depending on the species and the balance of other nutrients in the feed. Minimum mineral requirements, as reported by various investigators, in comparison with the observed range in content of these elements in ladino, are shown in Table X.

TABLE X.—MINIMUM REQUIREMENTS OF ANIMALS FOR INORGANIC ELEMENTS

Element	Animal	Minimum Requirement	Range in Ladino
K	Milk cow	30 gm. a day	0.6—6.0%
Ca	Pregnant cow	0.42% of body wt.	0.70—2.90%
Mg	Pregnant cow	8 mgm. a lb. of body wt	0.21—0.66%
Na	Milk cow	0.15% of body wt.	0.01—0.74%
P	Young cattle	0.35% of body wt.	0.20—0.41%
Cl	Milk cow	0.19% of body wt.	0.34—1.56%
S	———	———	0.09—0.35%
Fe	———	———	210—1600 ppm.
Mn	Chicks	35–40 ppm. of feed	14—164 ppm.
Cu	Cattle	3 ppm. of feed	10.4—20.2 ppm.
Zn	Rats	0.04 mgm. a day	18—65 ppm.
I	Milk cow	0.4 mgm. a day	0.70—1.90 ppm.
Co	Sheep	0.07 ppm. of feed	0.05—0.22 ppm.

Ladino apparently contains sufficient K, Ca, and Mg to meet the needs of the animals that consume it. Since Na and Cl are usually supplied in the feed, there appears to be no problem from a deficiency of these elements. The P requirement of high-producing milk cows may not be met by feeding ladino alone. The Mn content of some ladino was found to be too low for growing chicks, but I was present in sufficient amounts in all samples. Sufficient Cu was present in all samples to prevent deficiency of this element in animals. Cu has value also in preventing Mo toxicity in cattle. It is believed that forage containing 1 to 3 ppm. Mo should contain 10 ppm. Cu.

Zn requirements for cattle are not known, but Zn deficiency is under suspicion as a possible cause of hyperkeratosis. Ladino from New Jersey farms where this disease was present

* Concluding the reprint of New Jersey Agricultural Experiment Station Bulletin 759, October 1951.

contained about 20 ppm. Zn. The normal Zn content of ladino plants is between 40 and 60 ppm.

Nutrient Balance Important in Fertilizers

K, Ca, Mg, and Na can replace one another to a considerable degree in ladino plants without interfering noticeably with growth. But a point is finally reached at which no further replacement can be effected without injury to the plant. For example, the K content of ladino was made to vary between 2 and 4 per cent without materially affecting the yield. When the K content of ladino reached 8.4 per cent, however, a sharp reduction in yield was noted. At that point, the percentages of Ca, Mg, and Na in the plant were very low. The principle here involved is that the sum of these four cations, expressed as equivalents, tends to be a constant for the individuals of any given species of plant, when grown under uniform environmental conditions and harvested at a uniform stage of growth.

The sums of the equivalents of the N, P, S, Cl, and Si for each individual harvest of ladino tended, likewise, to

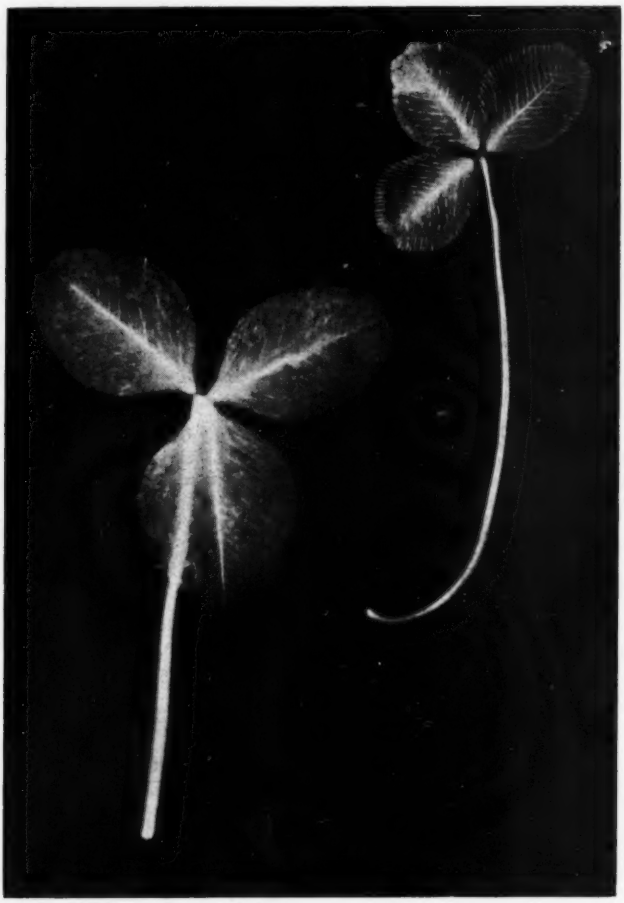


Fig. 6. Radioautograph of ladino leaves and petioles of plant receiving 3 microcuries Ca^{45} 14 days before leaves were removed. Pictures made by exposing X-ray film to plant parts in dark room for 1 month. Light areas indicate radioactive Ca.

Fig. 7. Radioautograph of stolon and leaves from ladino plant that received 3 microcuries Na^{22} 12 days before harvest. Picture made by exposing X-ray film to plant parts for 3 weeks. Note accumulation of radioactive Na in the older leaves.

be constant. The ratios of the cation to the anion milliequivalent sums for each of the several cuttings were even more nearly constant (Table XI).

An understanding of the principle of ion substitution in plants is important in deciding on liming and fertilizing practices. For example, Ca is a much less expensive element than K. It can be supplied in the form of pulverized limestone at one-sixteenth the cost of an equivalent quantity of K in muriate of potash. The first essential in ladino production is to see that the soil has been limed to a pH value between 6.0 and 6.5. This provides not only greater assurance of success with the crop but a better mineral balance within the plant. Ca deficiency results in a breakdown of the petioles and a decrease in root growth (Fig 9). It also lowers the feeding value of the ladino.

A survey of New Jersey pastures revealed that on about 25 per cent of the farms the K content of the ladino was more than 3 per cent, which is known to be unnecessarily high. In such cases, Ca could have been substituted for the excess K to advantage, both in terms of feeding quality of the crop and economy in its production. It is important to point out, however, that the K content of the ladino in most of the poorer pastures was so low as to indicate that a lack of this element was limiting yields.

Annual topdressing with K is re-

Fig. 8. Radioautograph for ladino stolon from plant that received 3 microcuries Cl36 14 days before harvest. The radioactive Cl is concentrated in the growing point, petioles, and leaf midribs.

quired to maintain stands of ladino on most soils in New Jersey. The need for 600 pounds of an 0-10-20 grade of fertilizer an acre is indicated. If N also is used, a marked increase in growth of grass and in its uptake of K will result. Unless extra amounts of K are applied, the grass will compete for the available K in the soil with resulting starvation of the ladino.

In topdressing ladino, consideration must be given to how the crop is to be utilized. If the ladino is made into silage or hay, large amounts of K will be removed from the land. If it is pastured, about 85 per cent of the K will be returned to the soil in the form of manure. Thus, on pastured land, there is a perpetual turnover of K between the plants and animals. Even so, a considerable amount of the element may be lost in the drainage water.

For most soils, 500 pounds of 5-10-10 fertilizer are recommended at seeding time. The N is added because several weeks are required before the young seedlings are able to accumulate as much N as they need from the air. The only other time that N is recommended for ladino is when trouble is encountered with bloat because of insufficient grass in the pasture mixture. By this means the percentage grass can be increased and likelihood of bloat greatly reduced.

A plentiful supply of B is needed in

the plow-depth of soil at all times to provide growth of adventitious roots on the stolons. These roots are necessary for vigorous growth of ladino. Application of 20 pounds of borax an acre annually on soils low in B has been found to be sufficient.

Benefit may be obtained from supplying manganese sulfate to soils that have been heavily limed. Where it is desirable to keep pasture soils acid, as is often the case where potatoes are included in the rotation, ladino yields can probably be increased by an application of Mo. One ounce MoO_3 on the seed for each acre is probably sufficient. Information is still lacking on the Zn and Cu needs of ladino in New Jersey.

Reduction of Bloat Believed Possible

Bloat is believed to be due to a toxic substance in legumes that paralyzes muscles of the rumen. This interferes with belching and results in an accumulation of gas. Bloating is usually associated with legumes and not with grasses.

A physiological study was made of the effect of the juices of ladino and various other plants on peristaltic movement, as registered by the gut of a rabbit. A 2-inch segment of the gut was removed from an animal immediately after it had been killed. This was suspended by means of a thread from a lever arm of a kymograph into a Tyrode bath containing the necessary salts and glucose required for continuation of the peristaltic movement. The bath was aerated and kept at body temperature. Each time the gut contracted, the lever arm was pulled up, and when the gut relaxed the lever arm dropped. The end of the lever made contact with a drum that revolved slowly and recorded the movement electrically by tracing on a metal-

Fig. 9. Calcium-deficiency symptoms in ladino indicated by withered petiole.

TABLE XI.—CATION AND ANION CONTENTS AND CATION-ANION RATIOS OF LADINO, AS INFLUENCED BY KIND AND AMOUNT OF FERTILIZERS

Treatment		Cations*					Anions*						Cation
No.	Elements†	K	Ca	Mg	Na	Sum	N	P	S	Cl	Si	Sum	Anion Ratio
		me.	*me.*	*me.*	*me.*	*me.*	*me.*	*me.*	*me.*	*me.*	*me.*	*me.*	
23	——	23	100	33	2	158	328	10	17	16	62	433	0.36
4	KPB	59	100	36	2	197	301	13	18	44	41	417	0.47
7	2KPB	80	75	30	1	186	328	11	9	43	71	462	0.40
8	3KPB	85	80	32	1	198	301	12	18	45	47	423	0.47
9	KPBNa	49	80	18	2	149	306	11	18	42	22	399	0.37
18	KPB2Mg	46	90	28	1	165	332	12	13	32	75	464	0.36
15	2K2PB	69	80	20	1	170	319	13	13	39	33	417	0.41
16	2K2PBMg	59	70	30	1	160	338	13	14	36	31	432	0.37
19	2K2PBCa	69	90	32	1	192	314	13	11	32	53	423	0.45

* These values can be converted to percentages by multiplying the me. K by 0.039, Ca by 0.020, Mg by 0.012, Na by 0.023, N by 0.014, P by 0.031, S by 0.016, Cl by 0.0355, and Si by 0.014.

† Per acre: K = 60 pounds K_2O, P = 60 pounds P_2O_5, B = 20 pounds borax, Na = NaCl equivalent to K, Ca = 1000 pounds $CaCO_3$, Mg = 160 pounds MgO as magnesium sulfate.

lic paper. Effects of juices from several plants are shown in Figure 10.

Juice from other plants gave characteristic tracings. For example, that from young wheat plants caused a stimulation of peristalsis. Alfalfa and red clover caused a relaxing, but much less than that from ladino.

The gut is very sensitive to the balance of inorganic elements in the Tyrode bath. Since ladino often contains high amounts of K and Ca, a test was made to determine whether solutions of KCl, KNO_3, and $CaCl_2$ would stop the movement. Each of these caused a sharp contraction of the gut, the opposite effect from that caused by ladino.

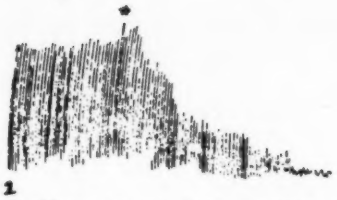
An animal bloated from legumes usually has a foamy mass in its rumen, which may have been produced from soap-like substances, known as saponins. To obtain saponins, dry ladino leaf meal was extracted with water and alcohol and precipitated with acetone. The precipitate was dark brown and produced a strong foam when shaken with water.

Saponins will add on to cholesterol and become inactive. Based on this principle, growth tests were conducted on White Leghorn chicks selected for uniformity of weight and maintained on experimental diets for 2 weeks (Table XII). Ladino extract was added to the basal feed in a water solution and mixed thoroughly.

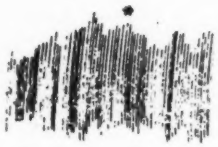
Chicks that received only a basal diet gained 96 gm. in 2 weeks. On addition of the ladino extract to the com-

TABLE XII.—AVERAGE GAIN IN WEIGHT OF 10 CHICKS DURING A 2-WEEK PERIOD, AS AFFECTED BY SAPONIN AND OTHER ADDITIONS TO THE FEED

	gm.
Basal diet	96.0
Basal diet + cholesterol	81.0
Basal diet + saponin	77.0
Basal diet + saponin + cholesterol	91.0
Basal diet + 20% ladino	56.0
Basal diet + 20% ladino + cholesterol	77.0



1
Ladino juice from Updyke pasture



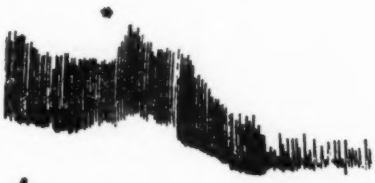
2
Timothy juice

2 ml. ladino juice from field fertilized with N
3

4
Birdsfoot trefoil

5
Boiled wild cherry juice

Boiled ladino juice



6
Juice from wild cherry leaves

Fig. 10. Kymograph tracings made with rabbit gut show effects of plant juices on peristalsis. Point at which plant juices were introduced with the gut indicated by asterisk; normal peristaltic movement at left of asterisk.

1. Two milliliters of juice from ladino collected the previous day from a field where a steer had just died from bloat was added to the bath. Stopping of peristalsis is evident.

2. Normal movement continued after juice from timothy taken from the same pasture had been added. A similar response was obtained from orchard grass juice.

3. Ladino was grown with high-N, high-K, low-K, low-N, and high-N-plus-high-K applications. Juice from each of these samples stopped movement of the gut. The same was true of ladino strains from California, New Jersey, Wisconsin, Washington, and Italy.

4. An unusual effect obtained from birdsfoot trefoil. There is nothing in the literature, however, to indicate that this plant causes bloat.

5. The active material in ladino is not prussic acid, a nerve poison sometimes found in white clover and a number of other plants. The juices from ladino and from wild cherry leaves were boiled 5 minutes to drive off any prussic acid they might contain.

6. Effect of unboiled wild cherry juice on gut movement. The prussic acid in the unboiled juice of this plant greatly retarded the movement of the gut.

plete diet, the average gain was 77 gm. On addition of 1 per cent cholesterol to the basal diet plus extract, the chicks gained 91 gm. Thus the cholesterol had a neutralizing effect on the growth-inhibiting substance.

It was thought that this growth-inhibiting effect might be due to the action of the foam in decreasing the adsorptive area in the intestines. A group of chicks fed a 20 per cent ladino feed gained as rapidly in 2 weeks as did others fed the same diet plus 0.2 per cent of an antifoaming silicone. This indicates that foam *per se* was not the growth-inhibiting factor.

Cholesterol is found only in animals and, if present in excess, may be toxic. Recently, however, sterols from soybeans have been found to counteract the saponins in alfalfa equally as well as cholesterol. The fact that a toxic substance produced in one plant can be neutralized by a compound present in another plant is highly significant, and suggests the desirability of having variety in the diet. This calls for a greater number of species of plants in pastures.

The evidence shows that ladino contains substances that retard the activity of isolated rabbit muscle and depress the growth of chicks. Nevertheless, this clover is one of the best of the pasture plants. When the nature of these substances is better understood, the deleterious effects can probably be reduced or eliminated by breeding. Much can also be done by improved seeding and soil-fertility practices that result in a greater variety of pasture vegetation.

Summary and Conclusions

Field, greenhouse, and laboratory studies were made on ladino to determine its mineral requirements.

One field experiment, covering a 3-year period, was designed to study rates and dates of application of standard fertilizer materials and any possible need for minor elements.

Prior to seeding, 500 pounds 5-10-10 fertilizer an acre were applied. N was included in the fertilizer mixture to help the young seedlings become established.

Highest yields were obtained by topdressing with 180 pounds K_2O an acre annually, together with 60 pounds P_2O_5 and 20 pounds borax. Of the other nutrients, only Mg had supplemental value. Topdressings in early spring were more effective than those made after the first or second harvest.

Plots receiving at seeding time five times the standard fertilizer application, or 300 pounds each of K_2O and P_2O_5, and no subsequent topdressings were among the lowest in yield.

In other field studies on possible nutrient competition between ladino and orchard grass, one third of the plots were planted to ladino, one third to orchard grass, and the remainder to a mixture of ladino and orchard grass. K and N were the variables.

Orchard grass was favored by applications of N, and ladino by applications of K.

On the mixed plots, the percentage ladino, on a dry-weight basis, varied between 13 and 51, the lowest being on plots that had been fertilized with N.

The orchard grass contained relatively high percentages of K, P, Mn, and Cl, whereas ladino was relatively high in Ca, Mg, Na, N, and Fe.

The orchard-grass-ladino mixture from plots not fertilized with N contained the equivalent of 125 pounds K an acre. On comparable plots that received N, it contained 184 pounds K.

Analyses of orchard grass and ladino growing in association in seven states showed that the K content of the grass averaged 3.1 per cent, in comparison with 2.3 per cent for the ladino.

These studies show that annual topdressings with 600 pounds of 0-10-20 fertilizer an acre are effective in maintaining good ladino stands and yields.

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Half Way There

By Sam Dent[1]
and Ivan E. Miles[2]

LONG years ago, Dr. Tait Butler then Editor of the PROGRESSIVE FARMER wrote an editorial in which he said, "I have been in agricultural work for 40 years and during that time, I have published numerous stories about boys and girls or adults who produced more than 100 bushels of corn per acre. Each year, I have been invited to assist and vouch for the harvest of an acre or field that was expected to produce 100 bushels or more. I am sorry to say that I have not yet had the privilege of being present when such prize acres reached that 100-bushel mark. They always fail by a few bushels. I am still hoping to see 100 bushels of corn per acre grown in the South. I will spend $500 in travel and expenses to see it, if I have any reasonable assurance that I will see it."

Good old Dr. Butler, could see his dream acre of corn today in many areas of the State of Mississippi. Individual corn growers have grown good yields on their "pet patches" for a long time. For example, Carmack Deaton, as a member of the original Boy's Corn Club, forerunner of the 4-H Club, produced over 100 bushels per acre in 1910, 1911, and 1912. In fact, he was awarded a State Certificate for EXCELLENCE in Corn Growing in 1910. In the early 1940's there were several individual 4-H Club members, under the sponsorship of the American Potash Institute, who produced 100 bushels or more of corn per acre on an individual acre basis.

In recent years, growing good corn has grown into more than an individual acre on an individual farm project. It has become a community and even a county project. In the middle 1940's, an alert and aggressive agricultural teacher, Professor Ellis, in one community in Lowndes County started a higher corn production program. From that day forward, he and his farmers have done a very outstanding job on a community basis.

On a still broader basis, Tishomingo County took the initiative in the higher corn production program and perhaps stood out above most of the other counties for several years. At the present time, a number of other counties are also doing some excellent work.

Fig. 1. Carmack Deaton, first 100-bushel corn producer in Tishomingo County, Mississippi, produced 83 bushels in 1909, 105 in 1910, and 153 bushels in 1911. His sons, Desmond and Colus, have followed in his footsteps by producing well over 100 bushels in recent years.

[1] Formerly Associate County Agent in Tishomingo County, Miss., and now manager of a Co-operative in Tenn.

[2] Miss. Extension Agronomist on loan to U. S. State Dept. on Special Technical and Economic Mission to the Philippines.

TABLE I.—TRENDS IN HYBRID CORN ACREAGE AND YIELD PER ACRE OVER 10-YEAR PERIOD 1940-1950

Year	Total corn Acreage planted	Acreage planted to hybrid corn	Percentage of total planted to hybrids	Yield per acre in bushels
1940	3,077,000	67,694	2.2%	14.0
1941	3,015,000	81,405	2.7%	17.5
1942	2,909,000	93,088	3.2%	17.0
1943	2,851,000	108,338	3.8%	15.5
1944	2,736,000	117,648	4.3%	16.0
1945	2,572,000	123,456	4.8%	20.0
1946	2,417,000	132,935	5.5%	15.1
1947	2,320,000	278,400	12.0%	16.5
1948	2,250,000	371,250	16.5%	24.0
1949	2,182,000	501,860	23.0%	23.0
1950	2,357,000	530,325	22.5%	26.5

In spite of these localized areas, where some real progress has been made in growing corn, the State average, as a whole, was not affected much until about 1948, and there is still much to be desired even today. The trends in corn yields as well as the use of hybrids for the State are shown in Table I.

It is not meant to infer that the progress in yield over the 10-year period was due solely to the use of hybrid corn. This was only one factor, though it was an important one. It should be pointed out also that plant food usage expressed as N, P_2O_5, and K_2O increased from 55,906 tons in 1940 to 152,966 tons in 1950. The increase in plant food was one of the most important factors in increasing the corn yield. To be sure, there were still other factors involved, some of which will be treated upon below.

Since Tishomingo County[3] was one of the first counties to initiate a big corn production program, on a county basis, it might be of interest to look with a little more detail at some of the practices that contributed to their progress in this field.

During the last 10 years, yields of 150 bushels per acre or more have been produced in the County and yields of more than 100 bushels per acre have

[3] All agricultural agencies in the county have participated and cooperated wholeheartedly in this corn program.

TABLE II.—PROGRESS IN CORN PRODUCTION IN TISHOMINGO COUNTY 1934-1950 *

Item	1934–36 3 yrs.	1937–39 3 yrs.	1940–42 3 yrs.	1943–45 3 yrs.	1946–47 2 yrs.	1948–50 3 yrs.
	County-wide Data					
Yield per acre in bushel...	14.9	13.6	18.1	19.1	20.2	33.4
Acres in corn per farm....	11.0	10.2	10.9	9.9	10.1	10.5
	98 Unit Test Demonstration Farms					
Yield per acre in bushel...	14.5	12.8	18.9	25.4	39.0	55.0
Acres in corn per farm....	14.8	14.7	14.7	13.6	13.5	12.0

* These data were taken from annual reports on the TVA Unit Test farm demonstration program.

Fig. 2. The field on the left received identical treatment in every respect to the one on the right. The two fields join, but the one on the left is hilly, eroded soil and the one on the right is bottom soil. It produced 60 bushels more per acre than the hill soil even though it was a wet year. This work on crop adaptation was done by Dr. Otis Osgood of the Mississippi Experiment Station.

been produced, times without number. The average has increased from 14.9 bushels in 1935 to 35 bushels in 1950. This progression in corn production, along with the amount of corn planted per average farm and comparable data on 98 TVA Unit Test demonstration farms are shown in Table II.

Tishomingo County is located in the Northeast Highland soil area and consequently is somewhat broken in topography. About 75 per cent of the land is rolling to steep rolling while about 25 per cent is made up of narrow valleys with spring-fed ditches and streams running through them. In Dr. Butler's time and up until about 1945, much of the corn was planted on the hills as well as on the bottom lands. But now, most of the corn is planted on the valley bottoms and in broad valleys on second bottom or terrace soils. With better production, fewer acres are required to produce sufficient corn. This trend is shown in the yield and acres of corn per farm on the Unit Test demon-

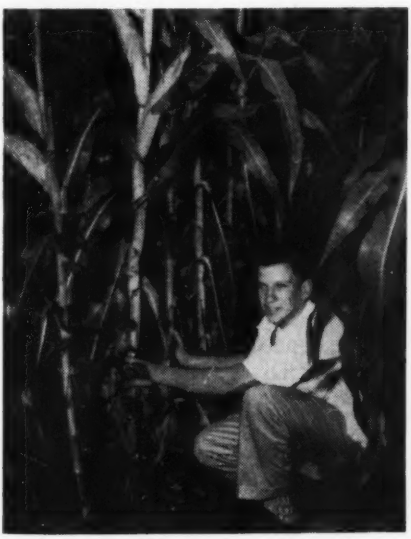

Fig. 3. Harold Davis, a 4-H Club member, shows thick spacing in his 142-bushel field.

Fig. 4. Wm. Howard Osborne shows off some of the corn from his record 194-bushel field.

Fig. 5. The effect of complete fertilization on corn compared to the row in the center that was not fertilized.

stration farms reported in Table II. As the yield per acre went up, there were fewer acres per farm planted to corn. Producing sufficient corn on fewer acres and on relatively flat valley land gets the corn off the shallow, eroded, droughty, hazardous hill soil.

In 1944 TVA ammonium nitrate was made available to the Unit Test demonstration farms. The 4H Club leaders out in the rural part of the County quickly sensed the fact that this was an excellent opportunity to demonstrate some good work. So they enrolled boys living on the Unit Test farms who had seen and knew what this additional nitrogen would do if it were used right and supplemented with the other essential plant foods. As a result of this effort, 29 4H boys exceeded 100 bushels per acre during the years 1944-1947. Then the boys really started to work. From 1948-1950, 149 more boys were added to the list as members of the 100-bushel club. These 4H corn club boys in Tishomingo County won State Championship in corn production five times out of the seven years and District Championship the other two years. The records made by these 4H boys and the FFA members, who also made some excellent records, convinced many adult farmers that good yields of corn could be made in the South if the approved practices used by these boys were adopted. Of a comparatively large number of 4H, FFA, and adult farmers who enrolled in the 100-bushel corn production program, 1944-1950, there were 987 who completed their records for the year. Out of this 987, there were 418 who reached the goal of 100 bushels or more per acre. A breakdown of these 987 records is shown in Table III.

Hybrid seed and proper fertilization go hand in hand in a high corn production program. Neither can realize its greatest success without the other. The farmers in this County had used various varieties of open-pollinated corn. They were not very enthusiastic about hybrid corn which had to have new seed purchased every year. However, in 1945, the Experiment Station, which did the basic work for this whole program, supplied the County with five bushels of Dixie 11. From these five bushels of seed, six boys produced 100 bushels or more of corn per acre that year. In 1946 and 1947 Dixie 17 and Tenn. 10 came upon the scene and were used considerably. By 1950, a number of other hybrids were being used to

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Fig. 1. Harvesting grass from Experiment Station nursery plots, June 1947.

New Grasses for the South

By J. Francis Cooper

Florida Agricultural Experiment Station, Gainesville, Florida

NEW and improved grasses in the Southeast are providing more cheap feed for cattle and other farm animals, aiding in soil conservation, and becoming the basis of another important farm commodity. Grass is now the basis of a several million dollar annual farm industry in Florida and is growing in importance in other states.

Formerly a neglected stepchild in the farm crops family, grass is now an important member of the group. Agronomists of the agricultural experiment stations and U. S. Department of Agriculture have been conducting research with grasses for many years; they have made their greatest strides in the last 15 years. They have added enormously to the nation's resources. They have sought higher yields, increased disease resistance, ability to survive and produce during unfavorable weather, more leafiness, higher protein content, and more palatability for livestock. While they haven't yet obtained all the answers, they have come up with strikingly superior varieties for both grazing and hay.

The University of Florida Agricultural Experiment Station has tested numerous grasses for pasture, hay, field grazing, and even for golf courses and lawns. New kinds have been tried in its plant introduction garden and in the field.

Among the newer pasture grasses, some of which also produce hay, attracting widespread attention in the Southeast are Pangola, Coastal and Suwannee (# 99) Bermuda, and common, Pensacola, and Argentine Bahia. The

fescues, Kentucky 31 and Alta, have not shown up well in Florida. Carpet grass, an old favorite, is still used in many pastures, particularly where it is desired to grow clovers and lespedezas in conjunction with grass. Pangola and the improved Bermudas seed lightly or not at all and are planted vegetatively. The Bahias produce seed.

Family Portraits

Pangola, introduced from Africa, belongs to the wooly-finger grasses and is related to crabgrass, a well-known crop pest in the Southeast. Pangola is a creeping perennial which prefers a moist, fertile soil but will grow on well-drained land. On fertile soil it will grow as tall as four feet, thus being suitable for grazing and hay. It is fairly cold-hardy, frosting down in the fall but coming out early in the spring. It produces many seedstalks with four to six branches. Its herbage is nutritious and palatable.

Both Coastal and Suwannee Bermuda, developed by Dr. Glenn W. Burton, USDA geneticist, at the Coastal Plains Experiment Station, Tifton, Georgia, meet grower requirements for a high-yielding grass that tolerates frost and withstands drought. Resistant to leafspot disease and immune to root-knot nematodes, they spread more rapidly and yield more than twice as much as common Bermuda. They are best suited to fertile soils not subject to flooding and grow to two or three feet tall.

The Bahias are natives of South America. Common has been grown in the United States for many years. Pensacola was discovered growing wild on vacant lots of the Florida city by County Agent E. H. Finlayson 10 years ago. It was thought to have come in as ballast on some ship years before. Argentine is a more recent introduction by the USDA through Tifton and the Florida Experiment Station's Plant Introduction Garden at Gainesville.

The Bahias grow well on moist but drained soils and are especially good for higher, drier lands. They have a very deep, fibrous root system and are able to obtain moisture if there is any in the neighborhood. At the Florida Station, roots of common Bahia have been observed to grow five feet in five weeks in early spring, and to attain a depth of eight feet or more.

Argentine and Pensacola have finer leaves than common and produce excellent grazing. Pensacola has been planted on thousands of acres in the Southeast and a thriving seed industry has developed. Bahia seedheads do not mature all their seed at the same time and consequently are not too well adapted to combine harvesting. County Agent Mitchell Wilkins at DeFuniak Springs and Mr. Finlayson worked out and patented a seed stripper with rubber rollers which pull hard enough to remove the mature seed but not hard enough to damage the seedhead or the immature seed.

Argentine has attracted immediate attention from farmers who have seen it. The Florida Station has not adequately checked grazing results on it yet, but every farmer who has seen it wants a supply of seed. The seed supply is still limited. Unfortunately, seedheads of Argentine Bahia are susceptible to ergot, the grain disease which will cause abortion in cattle.

Dallis, St. Augustine, and Para grasses seem adapted to pastures on muck lands and heavy soils, and Vasey is used to a small extent in Florida pastures. Cogon and torpedo (Panicum repens) are used some for pastures, but because both spread by underground runners and are difficult to eradicate, they are not generally recommended.

Produce Good Beef

That improved grasses, well fertilized and managed, are profitable producers of beef is well illustrated by grazing trials. At Tifton, Coastal Bermuda produced 569 pounds of beef per

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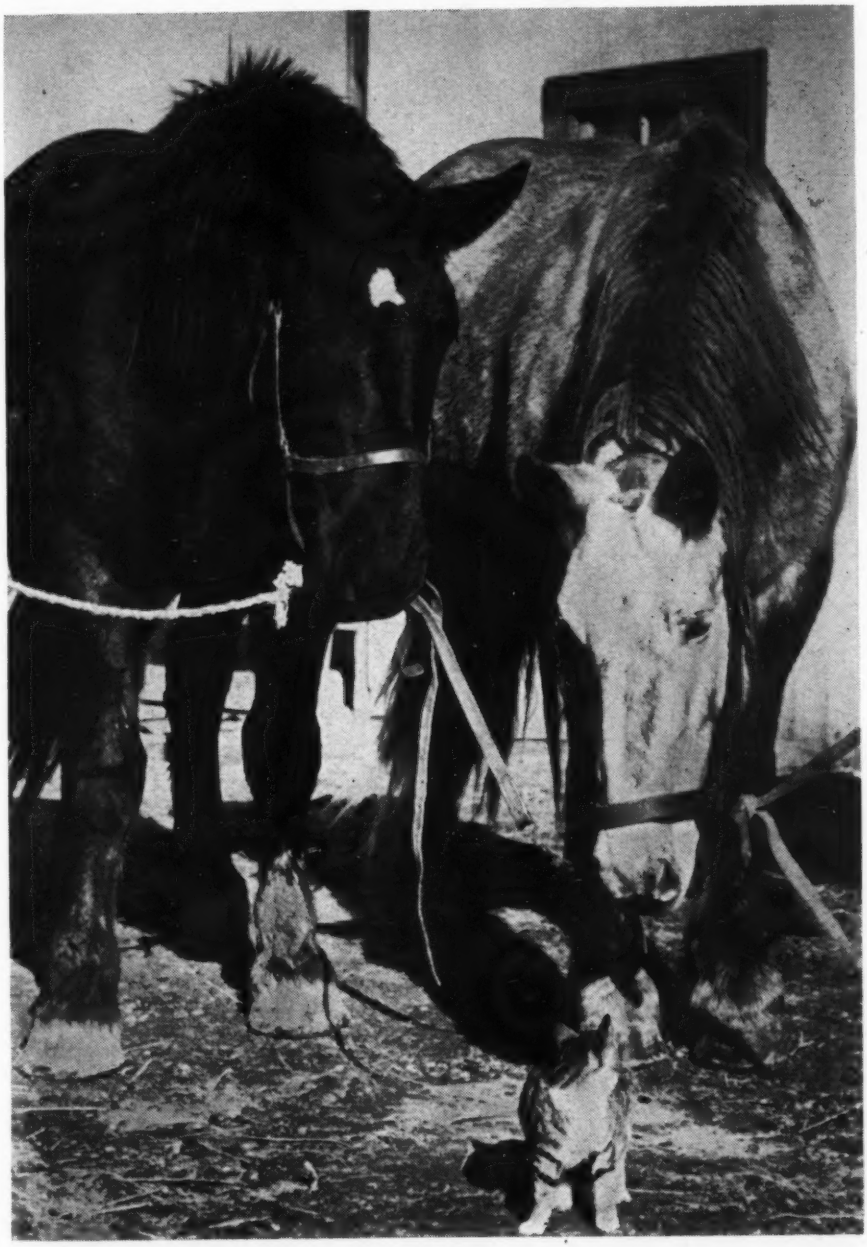
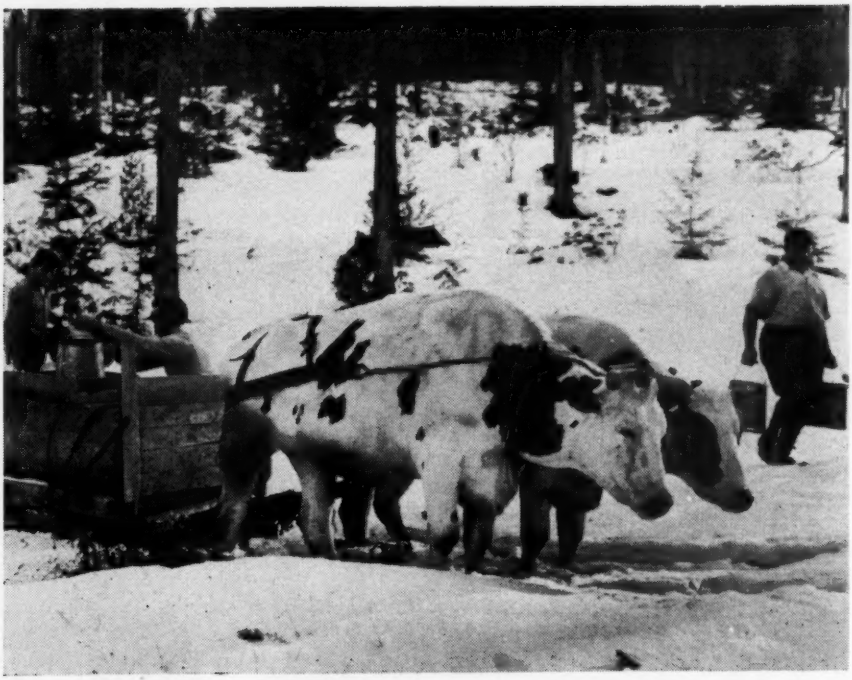
PICTORIAL



Who's Afraid?

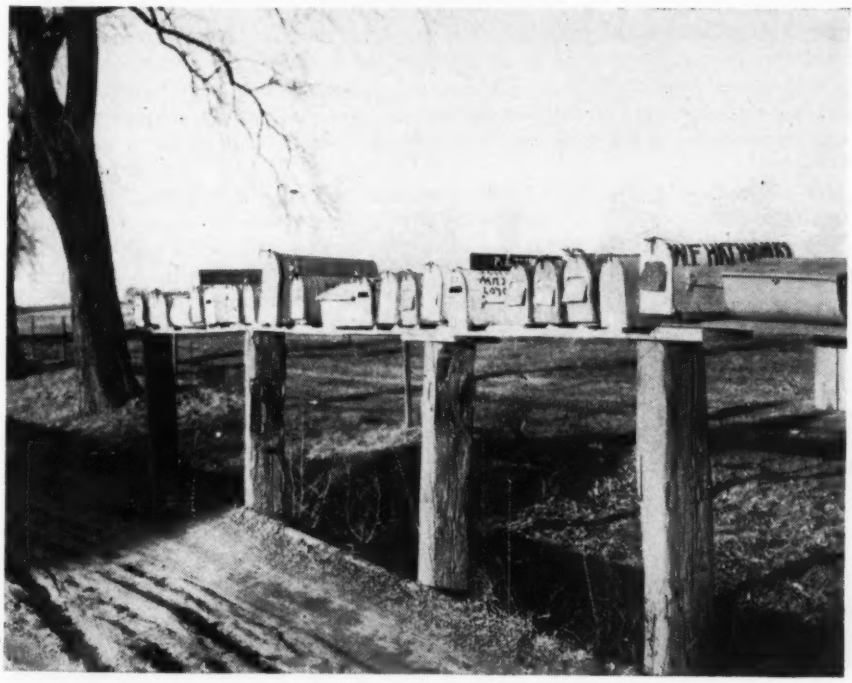


Above: **Syrup time a'coming.**

Below: **Nevada pasture scene.**

Above: **Winter farm auction.**

Below: **A rural post office.**



Above: **Decorated with ice.**

Below: **A California vineyard.**

The Editors Talk

Better Nutrition

The annual meeting of the American Association for the Advancement of Science is always a sounding board for the new developments of research in the betterment of our civilization. Widely publicized, these findings are of great public interest and deserve the attention given them.

Of such interest at the meeting held the latter part of December in Philadelphia was a symposium on the mineral nutrition of plants, animals, and men, where Dr. Kenneth C. Beeson, Head of the U. S. Department's Plant, Soil, and Nutrition Laboratory at Ithaca, N. Y., held out hope for steady improvement in this field. Speaking of the advantages to be gained through breeding new varieties of crops designed as specially effective sources of different nutrients for both humans and animals, he said that the only extra cost of such a program is the initial cost of development. The improved food can then be produced year after year with no additional cost to the consumer or to the grower.

Because of the great number of factors that enter into the making of a crop and the makeup even of the same variety under different soil and climatic conditions, Dr. Beeson said more attention must be given to producing individual varieties for various regions. A variety of potatoes high in vitamin C and adaptable for commercial production in Maine might not, for example, produce an adequate crop in South Carolina. Either there must be local varieties for each region, or varieties adapted to wide ranges of soil and climatic conditions must be developed.

He emphasized the important economic effects often brought about by introducing one or more entirely new crops into a region to supply a nutrient known to be lacking. He gave the development of better pasture as an example of how it is possible on soils deficient in cobalt, copper, or phosphorus to improve productivity of the farm animals and nutrition of the people of a locality by introducing a forage crop with greater power for accumulating the particular element needed. In other areas, the displacement of high-carbohydrate crops with some having more and better quality protein can make much improvement in human nutrition.

These possibilities indicate the practical turn that studies of soils and of crop, animal, and human nutrition have been taking lately. To illustrate this he cited that in the Northeast, where timothy hay very low in cobalt seems associated with nutritional difficulties with dairy cattle, the solution for more cobalt may be found in growing legumes with the timothy. Evidence obtained in New York State indicates that any hay mixture containing 50 per cent or more of legumes will give dairy cattle enough cobalt regardless of a low supply of the element in the soil. Legumes have long been favored in hay mixtures, especially for dairy cows, and this broader look at various parts of the nutrition problem seems to be another reason for increasing the proportion of legumes.

For better nutrition throughout the world, Dr. Beeson finds hope in the

nutrition and breeding studies conducted by the U. S. Department of Agriculture and the State experiment stations which will adapt plants better to different soils and adapt crops better to animals. Such development might be expected to utilize much marginal land for efficient crop production. "Soil and plant scientists," he said, "are ever impressed with the potential fertility of our soils, even in those situations where they have been used for a very long time. With proper management practices, including the judicious use of fertilizers, there seems to be no reason to doubt that food of high nutritional quality can be produced in abundance."

While no revolutionary practices in farming are apt to result in the immediate future, it is safe to say that as the nutritional requirements of more of our soils and crops become known through soil and tissue tests, the faster this adaptation will proceed. The strides made in the use of such tests over the past few years is our assurance of better nutrition.

Our Cover Picture

In this month's cover illustration we are showing typical potash-deficiency symptoms on alfalfa—Queen of the Forage Crops. It has been said that of all the nutritional starvation symptoms observable on legumes, those of potassium hunger are probably the most outstanding and easily recognized.

The first signs of potash deficiency on alfalfa appear as numerous small white or yellowish dots around the outer edges of the tips of leaves. As the deficiency becomes greater, these edges begin to turn yellow and the chlorosis proceeds around the entire leaf margin. This tissue then dies and becomes brown and dry. In the more advanced stages, the edges of the leaves become broken and ragged.

Potash deficiency on alfalfa and other legumes can be distinguished from nitrogen hunger by the distinct yellow color around the tip of the leaves. In the case of nitrogen deficiency, the green color gradually assumes a yellowish tinge over the entire leaf.

While it is important to be able to recognize and identify plant-food starvation symptoms on crops, it is more important to know their plant-food requirements and see that they are provided. For instance, a 3-ton yield of alfalfa utilizes 135 pounds of potash. Unless soil and fertilizer can make this amount available, the yield will suffer long before any visible starvation symptoms appear.

Probably second only to having enough lime in the soil and subsoil, the most troublesome nutritional problem is that of keeping alfalfa properly supplied with potassium. Alfalfa is a greedy feeder on this plant-food element and may use more than it actually needs if an overabundant supply is available at any one time. This tendency to luxury consumption draws heavily on the soil's supply to the detriment of succeeding cuttings.

It is easily possible for one to make a heavy application of potash with the reasonable anticipation that he is supplying enough to last the crop for several years. Actually, however, if all of this potash is applied at one time, the first cutting or two is apt to be abnormally high in this nutrient and succeeding cuttings may suffer from a deficiency. Such a condition can shorten the life of the stand. In practice, it has been found that frequent lighter applications as topdressings will be more effective than heavy applications made at infrequent intervals.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1926	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930	9.5	12.8	91.2	108.1	59.8	67.1	14.06	22.04	....
1931	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949	28.6	45.9	128.0	214.0	124.0	188.0	16.50	43.40	....
1950	40.1	51.6	91.6	173.0	153.0	200.0	16.70	86.50	....
1951									
February	41.75	32.5	103.0	205.0	160.0	221.0	18.45	100.00	....
March	42.73	26.6	107.0	207.0	160.0	212.0	18.35	103.00	....
April	43.17	25.3	112.0	203.0	162.0	214.0	18.35	103.00	....
May	42.45	39.8	109.0	209.0	164.0	211.0	18.15	101.00	....
June	42.02	49.0	108.0	210.0	162.0	208.0	16.85	95.60	....
July	39.11	49.5	118.0	219.0	163.0	205.0	15.45	78.00	....
August	34.60	47.7	117.0	273.0	165.0	205.0	15.65	69.10	....
September	33.73	52.4	123.0	287.0	165.0	207.0	16.55	66.10	....
October	36.21	57.7	139.0	271.0	164.0	210.0	17.15	69.90	....
November	41.00	50.0	174.0	280.0	162.0	219.0	18.35	72.70	....
December	40.34	51.0	193.0	305.0	169.0	222.0	19.65	71.50	....
1952									
January	38.70	46.2	207.0	347.0	168.0	220.0	20.75	70.10	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1926	101	179	189	134	116	138	112	98	139
1927	163	207	146	124	132	135	87	154	127
1928	145	200	76	134	131	113	95	152	154
1929	135	183	189	133	124	117	92	137	137
1930	77	128	131	123	93	76	93	98	129
1931	46	82	66	83	50	44	73	40	115
1932	52	105	55	62	50	43	52	46	102
1933	82	130	118	79	81	84	68	57	91
1934	100	213	64	91	127	96	111	146	95
1935	90	184	85	80	102	94	63	135	119
1936	100	236	164	106	163	116	94	148	104
1937	68	204	76	89	81	109	74	87	110
1938	69	196	80	79	76	64	57	97	88
1939	73	154	100	84	88	78	67	94	91
1940	80	160	78	97	96	77	64	96	111
1941	137	264	116	105	117	107	82	211	129
1942	153	369	168	134	143	124	91	202	163
1943	160	405	188	235	174	154	125	231	245
1944	167	420	214	216	170	160	139	234	212
1945	181	366	205	232	198	170	127	227	207
1946	263	382	178	248	212	209	141	319	182
1947	257	380	232	248	336	259	148	381	226
1948	245	482	222	253	201	226	155	298	214
1949	231	459	184	244	193	213	139	192	201
1950	323	516	131	197	238	226	141	384	185
1951									
February	337	325	148	233	249	250	155	443	333
March	345	266	154	236	249	240	155	457	265
April	348	253	161	231	252	242	155	457	225
May	342	398	156	238	255	239	153	448	239
June	339	490	155	239	252	235	142	424	189
July	315	495	169	249	254	232	130	346	204
August	279	477	168	311	257	232	132	306	181
September	272	524	176	327	257	234	139	293	161
October	292	577	188	309	255	238	144	310	171
November	331	500	250	319	252	248	155	322	249
December	325	510	277	347	263	251	166	317	331
1952									
January	312	462	297	395	262	249	175	311	337

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950	3.00	1.95	11.01	11.70	10.21	9.36
1951						
February	3.13	1.88	13.58	11.39	11.53	11.30
March	3.13	1.88	13.56	11.41	11.53	11.53
April	3.13	1.88	13.61	11.50	11.17	11.35
May	3.13	1.88	13.84	10.41	10.09	10.25
June	3.13	1.88	13.53	9.98	8.87	8.50
July	3.13	2.03	12.37	10.06	8.68	8.56
August	3.13	2.07	11.94	10.41	8.66	8.66
September	3.13	2.07	11.50	10.78	9.26	9.26
October	3.13	2.07	12.85	11.28	10.56	10.32
November	3.34	2.07	13.93	11.28	10.39	10.25
December	3.34	2.07	14.27	11.28	10.08	10.02
1952						
January	3.34	2.07	14.27	11.28	10.39	12.16
	Index Numbers (1910-14 = 100)					
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950	112	68	315	331	303	266
1951						
February	117	66	388	323	342	321
March	117	66	388	323	342	328
April	117	66	389	326	331	322
May	117	66	395	295	299	291
June	117	66	387	283	263	241
July	117	71	353	285	258	243
August	117	73	341	295	257	246
September	117	73	329	305	275	263
October	117	73	365	320	313	293
November	125	73	398	320	308	291
December	125	73	408	320	299	285
1952						
January	**125**	**73**	**408**	**320**	**308**	**345**

Wholesale Prices of Phosphates and Potash * *

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950	.763	3.83	5.47	.371	.716	14.33	.195
1951							
February	.810	3.98	5.47	.420	.796	16.00	.210
March	.810	3.98	5.47	.420	.796	16.00	.210
April	.810	3.98	5.47	.420	.796	16.00	.210
May	.810	3.98	5.47	.420	.796	16.00	.210
June	.810	3.98	5.47	.355	.708	13.44	.176
July	.810	3.98	5.47	.389	.768	14.72	.193
August	.810	3.98	5.47	.389	.768	14.72	.193
September	.810	3.98	5.47	.386	.768	14.72	.193
October	.820	3.98	5.47	.386	.768	14.72	.193
November	.820	3.98	5.47	.386	.768	14.72	.193
December	.820	3.98	5.47	.420	.827	16.00	.210
1952							
January	.820	3.98	5.47	.420	.827	16.00	.210
Index Numbers (1910-14 = 100)							
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950	142	106	112	68	75	59	83
1951							
February	151	110	112	75	84	66	85
March	151	110	112	75	84	66	85
April	151	110	112	75	84	66	85
May	151	110	112	75	84	66	85
June	151	110	112	65	74	56	80
July	151	110	112	70	81	61	82
August	151	110	112	70	81	61	82
September	151	110	112	70	81	61	82
October	153	110	112	70	81	61	82
November	153	110	112	70	81	61	82
December	153	110	112	75	87	66	85
1952							
January	153	110	112	75	87	66	85

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1926	146	150	146	119	94	135	112	86
1927	141	148	139	116	89	150	100	94
1928	149	152	141	121	87	177	108	97
1929	148	150	139	114	79	146	114	97
1930	125	140	126	105	72	131	101	99
1931	87	119	107	83	62	83	90	99
1932	65	102	95	71	46	48	85	99
1933	70	104	96	70	45	71	81	95
1934	90	118	109	72	47	90	91	72
1935	109	123	117	70	45	97	92	63
1936	114	123	118	73	47	107	89	69
1937	122	130	126	81	50	129	95	75
1938	97	122	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	123	130	127	86	56	130	102	77
1942	158	149	144	93	57	161	112	77
1943	192	165	151	94	57	160	117	77
1944	196	174	152	96	57	174	120	76
1945	206	180	154	97	57	175	121	76
1946	234	197	177	107	62	240	125	75
1947	275	231	222	130	74	362	139	72
1948	285	250	241	134	89	314	143	70
1949	249	240	226	137	99	319	144	70
1950	256	246	236	132	89	314	142	72
1951								
February	313	267	268	141	91	358	151	78
March	311	272	269	142	91	357	151	78
April	309	273	268	141	91	353	151	78
May	305	272	266	139	91	334	151	78
June	301	272	265	134	91	311	151	69
July	294	271	261	135	93	297	151	74
August	292	271	258	135	94	294	151	74
September	291	271	258	135	94	300	151	73
October	296	272	259	140	94	335	153	73
November	301	274	259	143	98	343	153	73
December	305	273	258	144	98	342	153	78
1952								
January	300	275	258	144	98	347	153	78

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only; manure salts since June 1941, other carriers since June 1947.

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. The maximum discount is now 16%. Applied to muriate of potash, a price slightly above $.353 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Store and Use Barnyard Manure Properly for Conservation Efficiency Profits," Ext. Serv., Univ. of Ida., Moscow, Ida., Ext. Cir. No. 106, June 1950, V. T. Smith.

"Poultry Manure is a Valuable Fertilizing Material," Ext. Serv., Univ. of Md., College Park, Md., Fact Sheet 39, F. L. Bentz, Jr. and E. K. Bender.

"Inspection of Commercial Fertilizers and Agricultural Lime Products," Agr. Exp. Sta., Univ. of Mass., Amherst, Mass., Control Series, Bul. No. 150, July 1951.

"North Carolina Fertilizer Report 1950-1951," N. C. Dept. of Agr., Raleigh, N. C., No. 125, Dec. 1951.

"Recommendations with Reference to the Fertilization of Flue-Cured Tobacco Grown on Average Soils in Virginia, North Carolina, South Carolina, Georgia, and Florida," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Agron. Info. Cir. No. 152, Nov. 1951.

"North Carolina Fertilizer & Fertilizer Materials Tonnage Report 1951-1952 Fiscal Year," N. C. Dept. of Agr., Raleigh, N. C., Dec. 31, 1951.

"Urea-Formaldehyde and Other Nitrogenous Fertilizers for Use on Turf," Agr. Exp. Sta., Pa. State College, State College, Pa., Bul. 542, Sept. 1951, H. B. Musser, J. R. Watson, Jr., J. P. Stanford, and J. C. Harper, II.

"Greenhouse Fertilizers," Ext. Serv., Pa. State College, State College, Pa., Leaf. 148, Nov. 1951, E. G. Price and J. G. Seeley.

"South Carolina Fertilizer & Fertilizer Materials Tonnage Report 1950-1951," Clemson Agr. College, Clemson, S. C., Aug. 13, 1951.

"Fertilizer Experiments with Cotton," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Bul. No. 220, March 1951, O. H. Long and B. P. Hazlewood.

"Vermont Recommendations for Seed, Fertilizer, and Lime 1952," Agron. Dept., Univ. of Vt., Burlington, Vt.

"1951 Results of Fertilizer Demonstrations of Small Grain and Hay," Soils Dept., Univ. of Wis., Madison, Wis., C. J. Chapman.

"Soil and Fertilizer Investigations with Radioisotopes, 1951," Bur. of Plant Industry, Soils and Agr. Eng., USDA, Beltsville, Md., Dec. 19, 1951.

Soils

"Irrigation Ditch Management on Arizona Irrigated Farms," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 237, Oct. 1951, R. Rehnberg.

"Soil Survey of Pictou County, Nova Scotia," Exp. Farms Serv., Can. Dept. of Agr., Truro, Nova Scotia, Rpt. No. 4, Mar. 1950, D. B. Cann and R. E. Wicklund.

"Terracing to Reduce Erosion," Ext. Serv., N. C. State College, Raleigh, N. C., Rev. Ext. Cir. No. 222, May 1951, D. S. Weaver and H. M. Ellis.

"Liming Soils for Better Farming," USDA, Wash., D. C., Farmers Bul. No. 2032, Nov. 1951, C. W. Whittaker, M. S. Anderson, and R. F. Reitemeier.

"Place of Summer Fallow in the Agriculture of the Western States," Cir. No. 886, Nov. 1951, O. R. Mathews; "Peat and Muck in Agriculture," Cir. No. 888, Oct., 1951, M. S. Anderson, S. F. Blake, and A. L. Mehring; "The Use of Sawdust for Mulches and Soil Improvement," Cir. No. 891, Nov. 1951, F. E. Allison and M. S. Anderson; USDA, Wash., D. C.

"How to Conduct an Instructional Field Trip Relating to Soil Conservation," U. S. Indian Serv., Wash., D. C., E. L. Wight.

"Soil Survey: Cherokee County, North Carolina," Agr. Res. Admin., USDA, Wash., D. C., Series 1941, No. 2, Sept. 1951, S. O. Perkins and W. Gettys.

Crops

"Sixty-First Annual Report for the Year Ending June 30, 1950," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Jan. 1, 1951.

"Report of the Minister of Agriculture for Canada for the Year Ended March 31, 1951," Ottawa, Ont., Canada.

"Report College of Agriculture," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Dec. 1950.

"The Production of Hybrid Corn Seed without Detasseling," Agr. Exp. Sta., New Haven, Conn., Bul. 550, Sept. 1951, D. F. Jones and P. C. Mangelsdorf.

"Know Florida—A Narrative and Graphic Guide to the Sixty-Seven Counties of the State," Dept. of Agr., Bur. of Immigration, Tallahassee, Fla., 1950.

"Reports on Agricultural Progress in Florida 1950," Dept. of Agr., Tallahassee, Fla.

"Topping and Spacing Flue-Cured Tobacco," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Aug. 1951, Cir. 20, J. M. Carr and I. Neas.

"Grass Waterways," Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Leaf. 337, 1951, G. A. Karstens and O. E. Ackerson.

"Youth Marches On . . . 1950 Annual Report," Ext. Serv., Kansas State College, Manhattan, Kansas, Cir. 228, June 1951.

"Louisiana Strawberries," Ext. Serv., La. State Univ., Baton Rouge, La., Ext. Pub. 1096, Rev. June 1951, J. A. Cox and W. F. Wilson, Jr.

"64th Annual Report of the Mississippi Agricultural Experiment Station for the Fiscal Year Ending June 30, 1951," Agr. Exp. Sta., Miss. State College, State College, Miss.

"Cultural Practices in the Bearing Apple Orchard," Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 789, Sept. 1950, M. B. Hoffman and D. Boynton.

"Grass Seed Production," Cir. A-139 (Rev.), Dec. 1950, I. T. Dietrich; "Grow Your Own Trees from Cuttings," Cir. A-157, Apr. 1951, J. J. Zaylskie; "Grass Silage," Cir. A-159, June 1951; "Alfalfa Varieties," Cir. A-165, July 1951, I. T. Dietrich; Ext. Serv., N. D. Agr. College, Fargo, N. D.

"A Summary of Corn Performance Experiments in Ohio: 1943 to 1949," Agr. Exp. Sta., Ohio State Univ., Wooster, Ohio, Res. Cir. 14, Aug. 1951, G. H. Stringfield and H. L. Pfaff.

"Performance Tests of Corn Varieties and Hybrids 1951," Agr. Exp. Sta., Okla. A & M College, Stillwater, Okla., Misc. Pub. MP-24, Dec. 1951, H. Pass and J. S. Brooks.

"Science for the Farmer," Agr. Exp. Sta., Pa. State College, State College, Pa., Suplt. No. 1, Bul. 540, 64th A. R., Dec. 1951, G. O. Bressler, D. C. Sprague, and A. S. Mowery.

"Fruit Varieties for Pennsylvania," Ext. Serv., Pa. State College, State College, Pa., Cir. 392, Nov. 1951, C. S. Bittner.

"Sixty-Second Annual Report," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Dec. 1950.

"Effects of Several Winter Cover Crops on the Yield of Cotton," Leaf. 109, Sept. 1951, B. P. Hazlewood and E. J. Chapman; "Corn Production in Tennessee," Leaf. 93, Sept. 1951, W. Pendergrass; Ext. Serv., Univ. of Tenn., Knoxville, Tenn.

"Agricultural Research in Texas 1950," Agr. Exp. Sta., Tex. A & M College, College Station, Tex.

"A Handbook of Agronomy," Agron. Dept., Va. Poly. Inst., Blacksburg, Va., Bul. 97, Rev. Oct. 1950.

"Growing Lima Beans in Irrigated Central Washington," Agr. Exp. Sta., Wash. State College, Pullman, Wash., Bul. No. 530, Oct. 1951, W. J. Clore and C. O. Stanberry.

"Summary of Survey on Grassland Farming in Western Region States," Ext. Serv., Wash. State College, State College, Wash., Ext. Mimeo. 1079, June 1951, E. V. Ellington and H. J. Henney.

"Recently Introduced Varieties of Head Lettuce and Methods Used in Their Development," USDA, Wash. D. C., Cir. 881, Sept. 1951, G. W. Bohn and T. W. Whitaker.

"Lettuce Varieties and Culture," Farmers Bul. 1953, Rev. Oct. 1951, R. C. Thompson; "Sugar Beet Culture in the Northern Great Plains Area," Farmers Bul. 2029, Oct. 1951, S. B. Nuckols; "Sericea in Conservation Farming," Farmers Bul. 2033, Sept. 1951, R. Y. Bailey; USDA, Wash., D. C.

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Economics

"1952 Tax Guide for Hawaiian Farmers," Ext. Serv., Univ. of Hawaii, Honolulu, Hawaii, Agr. Ext. Cir. No. 259, Rev. Dec. 1951.

"Seven-Year Summary of Grade Quality of U. S. No. 1 Maine Potatoes," Agr. Exp. Sta., Univ. of Me., Orono, Me., Rpt. No. 21, Aug. 1951, C. H. Merchant, J. E. Mayberry, and W. E. Schrumpf.

"Ohio Agricultural Statistics 1949 and 1950," Agr. Exp. Sta., Ohio State Univ., Wooster, Ohio, Bul. 722, Dec. 1951, G. S. Ray, J. R. Kendall, H. M. Clevenger, and E. R. Wescott.

"The Commercial Peach Industry in South Carolina," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 393, June 1951, T. L. Senn and J. S. Taylor.

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"Agricultural Production and Food Consumption in Western Europe," USDA, Wash., D. C., Agr. Mono. 10, July 1951.

"Apples, Production by Varieties 1951 with Comparisons," USDA, Bur. of Agr. Econ., Wash., D. C., Dec. 1951.

"1951 Annual Summary, Acreage, Yield, and Production of Principal Crops by States with Comparisons," USDA, Bur. of Agr. Econ., Wash., D. C., Dec. 1951.

Boron for Forage Crops . . .

(*From page* 12)

pared with the alfalfa-grass mixture.

Research work and observations show that practically all soils in Virginia are too low in boron to support a productive alfalfa crop. For this reason boron fertilization is recommended for all alfalfa plantings in Virginia. Preliminary work indicates that the soils may have enough boron for ladino clover. An experiment was established on a Cecil soil where the growths of ladino clover and alfalfa treated and not treated with boron were compared, Table III. The yield of ladino clover was 5,784 pounds per acre when treated with borax as compared with 5,231 pounds without borax. This was not a real difference. With alfalfa the yield was 9,835 pounds when treated with borax as compared with 6,771 pounds without borax. These results are averages for two years. About 50 per cent of the herbage was made up of crabgrass and weeds for the two-year-old plots of alfalfa which were not treated with borax, whereas the plots treated with borax were almost free of weeds.

TABLE II.—THE YIELDS OF DESIRABLE HERBAGE AND WEEDS FOR DIFFERENT MIXTURES FOR THE FIRST SPRING HARVEST FOLLOWING AN AUGUST SEEDING. (BLACKSBURG, VIRGINIA, 1951).

Mixture— Lbs. per Acre	Dry Yield— Lbs. per Acre	
Sown in August 1950—Harvested May 4, 1951		
	Desirable Herbage	Weeds
Ladino clover—2 lbs. Orchard grass—8 lbs.	657	375
Ladino clover—1 lb. Alfalfa—10 lbs. Orchard grass—3 lbs.	1,825	35
Sown in August 1950–Harvested May 29, 1951		
Alfalfa—20 lbs.	2,626	679
Alfalfa—20 lbs. Orchard grass—3 lbs.	2,963	162
Alfalfa—10 lbs. Ladino clover—1 lb. Orchard grass—1 lb.	3,337	300

TABLE III.—THE EFFECT OF BORON AND MINOR ELEMENTS ON DRY MATTER YIELDS OF ALFALFA AND LADINO CLOVER GROWN IN PURE STANDS. (CHATHAM, VIRGINIA, TWO-YEAR AVERAGE).

Treatment,* pounds per acre	Ladino clover	Alfalfa
Borax, 10 lbs.	5,784	9,835
NONE	5,231	6,771

* All plots were treated annually with 700 pounds of an 0-14-7 fertilizer; borax was applied annually.

All the bone in some folks' spinal columns seems to be lumped at the top.

There isn't much to see in a small town, but what you hear makes up for it.

Fertilizer Produces Profit

Reports from 10 demonstration plots in southeastern Ohio resemble reports of gold from fertilizer bags—but two extension agronomists at Ohio State University say they are not satisfied. D. R. Dodd and George Gist tell how a $15.80-investment in 10-10-10 fertilizer could return $23.22. Pasture plots treated with 480 pounds of 10-10-10 averaged 30 per cent more grazing during April, May, and June than pasture plots that received no treatment.

"If we assume an average of 60 days' grazing from bluegrass-white clover pastures during April, May, and June, the 30 per cent increase would mean an average 78 days' grazing on fertilized plots," the agronomists state. Thirty pounds of milk for each day of extra grazing would total 540 pounds of milk. At $4.30 per hundredweight, this would be a return of $23.22 for the $15.80 in 10-10-10 fertilizer.

"This is a small increase," Dodd and Gist agree. "In previous tests, 480 pounds of 10-10-10 applied in late March or early April should increase permanent pasture yields by 50 to 60 per cent." The small increase in 1951 probably was caused by late applications. On eight plots, fertilizer was at least a month too late.

Dodd and Gist advise farmers to apply high-nitrogen fertilizer to permanent pastures in early spring. Livestock should be turned on fertilized pastures as soon as practicable. Yield increases from nitrogen on permanent pastures come early in the season.

Phosphorus and potash may be applied any time. If neither of these is a limiting factor and early production is all that is desired, nitrogen alone will cost less than 10-10-10 and produce early pastures. Fertilizing permanent pastures will not solve summer pasture shortage.

Could Boost Corn Yields

Ohio farmers could increase their corn yields by more than 30 bushels per acre if they could follow recommended practices, according to D. R. Dodd, Extension Agronomist, Ohio State University. The Agricultural Extension Service and the Ohio Agricultural Experiment Station recommended at least twice as much fertilizer as was used last year.

"With good seed, adequate fertilizer, and good cultural practices, corn yields could average 82 bushels instead of the present 48-50 bushels per acre. Even though we're using two or three times as much fertilizer as we once did, we still are not using enough," Dr. Dodd said. "Present fertilizer production is not adequate to supply farmers with amounts recommended by authorities. Production is based on use. Until farmers start wanting more fertilizers, manufactures will not produce it."

Last year, farmers in Ohio, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin applied an average 79.8 pounds of fertilizer per acre to corn. Authorities recommended an average 175 pounds per acre. The eight states could have produced 235,447,000 more bushels of corn if farmers could have followed recommendations.

Dr. Dodd states that one way to in-

crease production is to use good management methods including fertilizer application. Fertilizer does its best job when it's used with good seed and cultural practices. To get better corn yields, most farmers need legumes, grass, fertilizer, and heavier planting rates.

With proper cultural practices, good corn land will yield best if about 15,000 plants per acre are produced. Most farmers do not plant corn that thick. On poor land, however, increased planting rates will not produce great yield increases.

New Grasses for the South . . .

(*From page* 26)

acre and still cut out 2,500 pounds of hay from the same acre. The hay is high quality, cures out more quickly than other adapted hay crops, and is more palatable than common Bermuda.

At the Florida Station over several years, unfertilized carpet grass pasture produced a beef gain of 75 pounds per acre during a grazing season of eight months. Fertilized grass yielded an average of 148 pounds, grass with lespedeza 219 pounds, and grass with white clover 619 pounds per acre per grazing season. With beef at 30 cents a pound, it is easily seen that fertilization and legumes pay.

Four-year average beef yields obtained from other fertilized grasses, in comparison with the 148 pounds from carpet, were: Pensacola Bahia and Pangola 212 pounds each, and Coastal Bermuda 225 pounds per acre.

Florida Station agronomists say it is possible to grow clovers in stands of Pangola, Coastal Bermuda, and the Bahias, but the combination is not too satisfactory unless properly grazed. The grasses grow so rank that they have a tendency to crowd out the clovers. By providing both nitrogen and organic matter, as well as additional feed where they will grow in

Fig. 2. Coastal Bermuda on the T. Stin Haselton farm, Eustis, Florida. The grass was sprigged in 42-inch rows July 10, 1944; photo made July 2, 1945. The County was allowed to use this increase plot for four years.

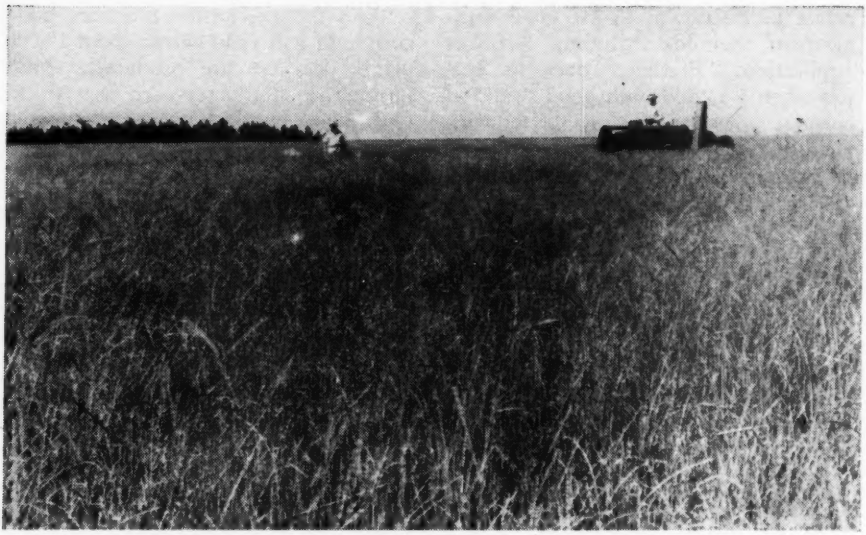

Fig. 3. John Creel, Walton County, harvested 10,000 pounds of Pensacola Bahia seed from this 40-acre farm with the new machine.

conjunction with grasses, the clovers help to make the grasses grow better.

Feed Them Well

Florida Station research has shown that fertilizing pastures just about doubles their carrying capacity of grass. Plant food applied in establishing and maintaining pastures brings returns comparable to those from applications made to field crops. The major elements are needed on most soils, except that nitrogen can be omitted on established mixtures of clovers and grasses. Lime and minor elements are needed in many cases, particularly on Florida soils.

For establishing carpet and Bahia grasses, Florida Station agronomists recommend 400 pounds per acre of 4-8-8 fertilizer. They say that 300 to 500 pounds of superphosphate or 1,000 to 1,800 pounds of rock phosphate may be substituted for the complete fertilizer, with fairly satisfactory results. The Bermudas, Dallis, and Pangola require more fertile soils which should be fertilized with one ton of lime and 400 pounds of 4-8-8 per acre prior to planting.

Where minor elements are needed, suggested rates are 10 to 20 pounds per acre of copper sulphate and manganese sulphate and 5 to 10 pounds per acre of zinc sulphate and borax. Applications may include any one or any combination of the minors that tests have shown the soils to need.

For maintaining carpet and Bahia the agronomists suggest minimum applications of 300 to 500 pounds of 6-6-6, 5-7-5, or 4-8-8 fertilizer every second year and say annual fertilization and higher rates give better results; for the Bermudas and Pangola, not grown in combination with legumes, 400 to 500 pounds of one of these analyses annually, with lime every three to six years. Nitrogen alone, applied in March, has increased grass yields materially, but a complete fertilizer is better. Nitrogen may be omitted or reduced in applications made to established pastures carrying legumes.

The improved grasses and fertilization are changing the pasture picture in Florida and other Southeastern states and building an ever-advancing cattle industry.

Potash Needs Move West . . .

(*From page* 10)

affected. Barley and wheat plants growing on a soil with low available potassium not only show typical leaf scorch but exhibit a greater number of leaf spots due to breakdown of tissues or the attacks of various organisms. The root system of plants deficient in potassium not only are smaller but do not have the healthy appearance of those well nourished. This is no doubt one of the principal factors responsible for severe lodging being associated with potash deficiency. It appears that a healthy plant is better able to withstand the attack of some of these diseases, and any deficiency that reduces the plant's vigor will enable the organism to gain a foothold.

That tapered and poorly filled tips of ears of corn occur on low potassium soil is well known. Analysis of these grains, even when the soil is well supplied with nitrogen, shows the protein content of the grain to be from 5 to 10 per cent less when potassium is inadequate, indicating a failure of the plant to absorb sufficient nitrogen. Other data indicate that with high available soil nitrogen and low potassium the nitrogen may be absorbed but not efficiently assimilated by the plant.

This increased need for potassium has been demonstrated by soil tests and is being recognized by farmers. In 1941, 2,149 tons of K_2O were used in Missouri. In 1950, 26,047 tons were applied and in the first six months of 1951 the figure was 24,996 tons. The average analysis of all fertilizer materials used in Missouri during 1941 contained 2.33% N, 12.14% P_2O_5, and 4.83% K_2O. For the first six months of 1951 the ratio was 4.26% N, 13.23% P_2O_5, and 8.76% K_2O. The percent-

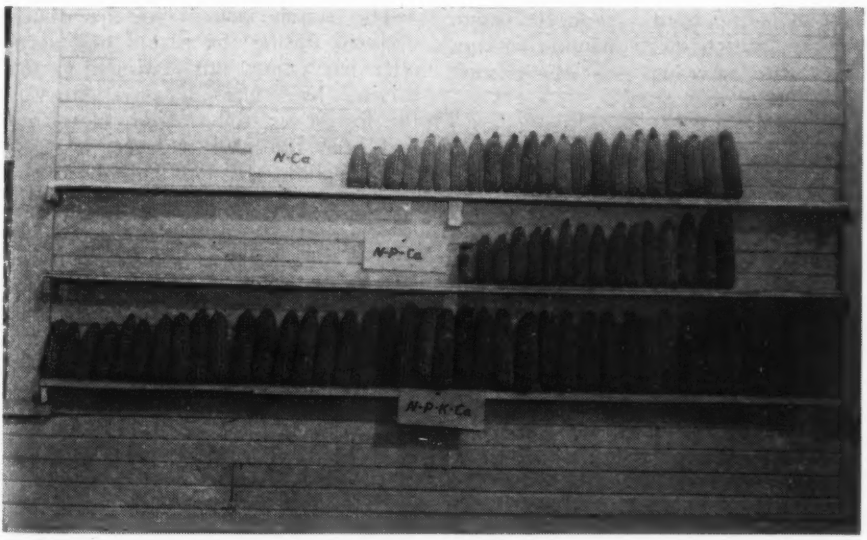

Fig. 5. The corn at top was produced on soil receiving only limestone and nitrogen—yield 67 bu. per acre. Ears in the middle were grown on soil receiving limestone, nitrogen, and phosphorus; previous heavy fertilization with phosphorus had exhausted potassium—yield 48.5 bu. per acre. The bottom row had complete treatment, limestone, nitrogen, phosphorus, and potash—yield 118.5 bu. per acre.

age nitrogen and potash nearly doubled while phosphate showed only about a 9% increase.

This trend of mineral potash use is reflected in recommended grades of mixed fertilizers in the corn and wheat states. In many cases mixtures containing only nitrogen and phosphorus or very little potash have been recommended in previous years. Each season shows more of the Midwest states adding formulas containing potassium or increasing the percentage of potash in the mixtures that are already in use.

On many Missouri soils it has been found that over-liming or excessive crop removal has reduced the exchangeable potassium to a level where it is difficult to add enough in mixed fertilizer to obtain optimum crop yields, particularly where nitrogen and phosphorus levels are adequate. By using soil tests as a guide, potash materials are being added in sufficient quantities to bring the exchangeable potassium to a level that will remove it as a limiting factor for crop growth. This heavy application is giving good response and has been an important factor in increased yields of grains and pastures in recent years.

Many of these soils do not contain clays with a high capacity for potassium fixation and after initial applications, yields can be maintained for several years by adding sufficient potash in the starter fertilizer to furnish the amount required by the crop. On soils with clays that will fix a large amount of the added potassium, starter applications for later crops are not sufficient and additional applications of potash materials will be necessary for optimum yields.

Ladino Clover . . .

(*From page* 20)

An application of 10 pounds copper sulfate an acre increased the Cu content of ladino from 12.5 to 20.2 ppm. An application of 5 pounds sodium molybdate increased the Mo content from 0.4 to 6.9 ppm.

P, Mn, and Co were not always present in ladino in amounts believed necessary for maintaining good health in grazing animals.

Mineral nutrients moved in either direction in the stolons, but those absorbed by adventitious roots tended to move mostly toward the growing points.

Effects of fertilizers on rates of depletion and renewal of starch following harvesting were studied, N and K being applied separately and jointly to a 3-year-old stand of ladino at the rate of 200 pounds each an acre.

Percentages of K, Ca, Mg, Na, P, Cl, and sugar, on a dry-weight basis, remained fairly constant in the plants following harvesting. The N percentage decreased, reaching a minimum after 14 to 18 days.

The starch content of the plants declined during the first 3 to 5 days after harvesting, but returned to the original level after 17 days. It was the lowest in stolons from plots that had been fertilized with N.

Radioautographs of ladino stolons showed that applied Ca45 was virtually absent from the pulvinus. This may explain the tendency for legume leaflets to shatter during harvest.

Accumulation of Na22 was dependent on the amount of K in the plant. The Na isotope was concentrated in the growing tips of K-deficient plants, but it accumulated in the older leaves of high-K plants.

A study was made of possible causes of bloat. Ladino juice was found to inhibit muscular movement in a rabbit gut. Alfalfa and red clover juices had similar but much less noticeable effects. Orchard grass and timothy juices had no effect.

Topdressing pastures with N tends to favor the growth of grass at the expense of ladino. If difficulty is being experienced with bloat because of too high a percentage of ladino in the pasture, this is one means of overcoming the difficulty.

The evidence suggests that safer and more nutritive grazing can be obtained by seeding a larger number of legume and grass species than is commonly employed.

In ladino, an unidentified substance, with properties similar to saponins, was found to inhibit chick growth.

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Half Way There . . .

(*From page* 24)

some extent and the total volume of seed corn had grown to 500 bushels for the County.

A number of comparisons were made between open-pollinated and hybrid corn on various kinds of soil and with two rates of fertilization. The soils in the County are generally pretty low in fertility and consequently crops grown on them respond to almost any fertilizer applied. This fact is reflected in the results obtained from a number of demonstration tests on hairy vetch cover crops and the use of triple-superphosphate as well as comparisons made on complete fertilization. The average increases in production of corn following the growing and turning under of a hairy vetch cover crop was 7.7 bushels per acre. The increased production from an application of 100 of triple-superphosphate was 9 bushels per acre. Where both phosphate was applied and hairy vetch cover crop was turned, the corn production was increased 15.3 bushels per acre. The effect of complete fertilizer is well illustrated in Figure 5.

In Figure 5, the row in the center had no fertilizer while on both sides of it the corn received 500 lbs. of 6-8-8 plus a sidedressing of 66 lbs. of actual nitrogen per acre. The fertilized area produced 130 bushels per acre and the untreated area produced 20 bushels per acre. Additional data gathered from a large number of these TVA Unit Test demonstration farms involving the comparisons between different rates of complete fertilizer and the varietal comparisons on various soils, which have been mentioned, are shown in Table IV.

The complete fertilizer was applied prior to planting and the additional nitrogen was applied as a sidedressing. A study of Table IV shows three things, namely:

1. The heavier fertilization paid very well.

2. The hybrid yields were much higher than the open-pollinated varieties.

3. The yields on the bottom and second bottom land were materially higher than the hill land for the hybrids but not so pronounced for the open-pollinated varieties.

TABLE III.—ONE HUNDRED BUSHEL CORN PRODUCTION PROGRAM REPORT FROM 987 FARMS, 1944-1950

Group	Produced 100 bushels or more per acre			Produced less than 100 bushels per acre		
	Number of fields	Number of acres	Average yield per acre	Number of fields	Number of acres	Average yield per acre
4H boys	178	198	119 bu.	215	246	72 bu.
FFA boys	27	27	118 bu.	47	58	73 bu.
Adults	213	293	113 bu.	307	511	72 bu.
Average Production	.....	.....	115 bu.	.....	.....	72 bu.

The average yield of the 418 men and boys who produced 100 bushels or more was 115 bushels per acre; and the average for the 569 who failed to reach the goal of 100 bushels was 72 bushels per acre. When both groups are put together, the average yield for the entire 987 who completed their records was 88 bushels per acre.

TABLE IV.—ONE HUNDRED BUSHEL CORN PRODUCTION PROGRAM SUMMARIZING VARIETY, FERTILIZER, AND SOIL CONDITION RESULTS ON A NUMBER OF FARMS IN TISHOMINGO COUNTY, 1949-1950

Variety	Fertilization	Bottom Land			Second Bottom			Hill Land			Average
		Number		Yield per acre	Number		Yield per acre	Number		Yield per acre	
		Farms	Acres		Farms	Acres		Farms	Acres		
Average for 13 hybrids	300 lb 5–10–5 plus 33 lb of nitrogen..	71	110	82 bu.	14	20	83 bu.	13	22	70 bu.	80 bu.
	500 lb 5–10–5 plus 66 lb of nitrogen..	489	645	95 bu.	112	141	97 bu.	65	86	88 bu.	95 bu.
Average for 7 open-pollinated	300 lb 5–10–5 plus 33 lb of nitrogen..	35	57	57 bu.	4	4	58 bu.	6	8	58 bu.	57 bu.
	500 lb 5–10–5 plus 66 lb of nitrogen..	126	163	83 bu.	29	45	71 bu.	23	31	74 bu.	79 bu.

Recently, there has been a very widespread interest in the corn program in the County. Consequently for the past several years, a five-day farm tour was made each year and thousands of farmers saw one or more of these corn demonstrations on these tours.

Summary

Information growing out of some rather intensive research work on hybrids and fertilization, not reported here, together with a number of years experience in successful corn production on the part of the farmers, have shown fairly conclusively the fundamental needs of the crop. Most of the fundamental needs of corn, if indeed not all of them, are supplied by following the approved practices in growing corn. These approved practices are:

Fig. 6. Many farmers have visited and studied the high-yielding corn demonstrations, such as this one on A. R. Hester's farm.

1. Select corn land—medium to well-drained bottom or second bottom land.
2. Plant an adapted hybrid as early as the soil warms up. Circulars and leaflets are in the agricultural leaders' hands in the field showing the hybrids adapted to each area of the State.
3. Fertilize according to the needs of the crop on the particular soil concerned. Test the soil to find the needs or apply liberal amounts of fertilizer such as 400-500 lbs. of 6-8-8 or 5-10-5 (except in the delta area) under the corn and sidedress with 90-100 lbs. of actual nitrogen.
4. Plant and leave thick—about 10,000 plants per acre.
5. Keep clean of grass and weeds until the crop is knee-high and then apply the additional nitrogen as a sidedressing, and lay it by.
6. Do not worry too much about the drought. The firing or burning of corn leaves is caused by starvation most of the time rather than by drought. If all of these practices are followed, 50 bushels of corn per acre could be grown most years and that is our goal.

Neither Tishomingo County nor Mississippi farmers are competing with the Corn Belt. But farmers are finding that they can produce high yields of corn by following the procedures outlined above. These high yields are making it possible to produce corn more economically. They help to keep the crop on land adapted to it. They help to release erosive, hazardous uplands for soil building and sod crops or trees. And finally, all of this helps to develop better balanced farming systems with livestock, a more stable agriculture, and a more stable economy for all concerned.

That Fifth Plate . . .

(*From page* 5)

over pre-war average. The hopeful statisticians look for us to reach 50 per cent levels above 1935-39 by 1955-60, and have their sights set on 67 per cent higher average levels of total farm output here by 1975, using the same base period.

I presume that all this forward-peering business imagines a consuming population that has good paying jobs and a rise in industrial might and power to make the family man's budget reflect prosperity of a lasting kind. Farmers are also food-users, and hearty ones too, so we must allow something for their prosperity also.

Likewise, we are presuming a fairly peaceful world—or are we? If we have settled peace and other countries begin to learn from us more about enhancing their own food production, we may drift back again into the doldrums of old depression days.

It always strikes me that our big job, and maybe our most puzzling one, is to keep up a flow of profitable abundance in a normal world of stability and calm. Can we do that successfully? Must we have a state of emergency and a war psychology to keep step through the years ahead with the rising demands of humanity for sustenance? What can we do to make the world community function without artificial stimulants? It's all to the good to seek a high-geared agriculture, but we've got to keep the highways open and safe for it to travel on and get somewhere. Farming is too blamed expensive these days for reckless expansion. Statecraft, not ballyhoo, is the answer we want.

During the recent months when agricultural authorities began to call for higher food production and all agencies were slanted to echo that platform, one or two economists pointed out the explosive situation that continually exists with such momentous advances in farm productivity at our

command. Their side remarks were regarded as contrary blows to the program being advanced. On the other hand, we maintain our official machinery well oiled for price-supporting programs, if and when the need arises. So let's not worry about being inconsistent or singing off-key a little on this score. An anchor to the windward and an eye skinned for possible breakers are only the usual role of the skillful navigator. We cannot hide our head in the sand and indulge in wishful thinking.

THE production dream will be realized, they say, if we make each five of our presently cultivated acres produce as much as six acres. The only other way to attain our 1975 goal would be to scrape up another virgin area of about 100 million acres suited to cropping. This would mean hunting around for as much new farm land as there is now in five leading agricultural states—Wisconsin, Illinois, Michigan, Indiana, and Ohio. So we agree right now that it can't be done by discovering new acreages.

Richer acre units, rather than more raw ones, will do the trick. In the past three decades our farmers have done just that to increase their total volume, so astounding and surpassing in scope. Conservation rotations and practices, improved varieties of cereals and grasses, a fuller use of fertilizers and lime, more adequate pest control, and discovery of better weed-killers, along with the most potent of all causes—mechanization and electric power—have been steadily responsible for the higher acre-yields of today.

Use of lime in the eastern, humid regions of the nation—24 million tons in 1949 alone—caused an increase in hay and pasture forages that matched the total forage production of Virginia and West Virginia, North and South Carolina, and Georgia. Were that extra tonnage of forage grazed or fed to beef cattle, it would have spelled 1¼ billion pounds of beef. Similarly, they claim that the 3 million tons of phosphate used for conserving practices in 1949 resulted in a harvest of 23 million tons more hay and pasture. This would take care of an extra block of beef cattle amounting to over 1½ billion pounds, liveweight.

Authorities also point out the entirely feasible effect that would come if we improved all the grasslands east of the 97th meridian, plus treatment of all the idle and eroded pastures of the South. This, they believe, using only average data, would allow our herdsmen to carry 97 million more animal units in this area. Converted to beef, this would be an extra annual output of 10 to 15 million tons—whereas we now produce only 5 or 6 million tons of beef per year.

Friends of the great grasslands epic affirm that there are more total digestible nutrients per acre obtained at less cost per hour of man labor with grass and legumes than with corn or other feed grains. Coupled with the constant progress being registered by the plant breeders and the stepped-up increase program for breeder seed, registered seed, and certified seed, we are on the verge of a new day in our destiny.

"GO-DOWN" crops, or green manuring, have often been known to boost corn yields 10 to 12 bushels an acre. When we learn that 250 million acres of land have been turned under in green-manuring practices since 1935, we may realize that something else besides hybrid corn has given us the great series of bumper corn crops of recent years.

Water that tears off topsoils and splashes and spatters soil grains away is being placed under control. Those barren slopes and ugly gashes in our countryside can be mended and restored to become an asset in our time and a surety for the consumers yet to come. More of those existing acres may be built up by contouring and terracing. Either system will add 4 to 5 bushels an acre to our corn yields. Since 1935,

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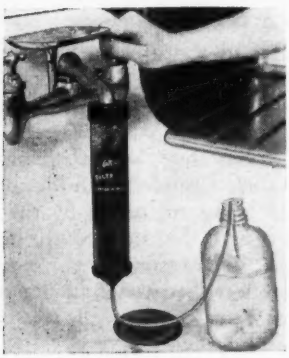

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120 million acres have been contoured, while 950,000 miles of terraces have been constructed.

Meanwhile the consumers must start to do some homework, too. Hitherto, too many of them have taken food supplies for granted. They have joined the anvil chorus in knocking and hammering the farmers for expensive food, which they point out makes up 26 per cent of the total outlay for living. They seldom pause to remember that the cash paid by farmers for their normal requirements and facilities helps keep the payrolls plethoric. They also overlook the truth that a daily wage-earner today can buy a lot more good food on his weekly stipend than his father could on his.

Populations rise while good, tillable land and productive pastures remain stationary or decline in ratio with consumers. In 1920 every person in this country had about 4 acres in open farm land as his portion of the food-producing zone. Today they reckon that you and I have only about 2¼ acres left from which to get our daily bread. That means roughly about one fair-sized city block of food-producing area to each man, woman, and child in America.

BUT as we mentioned before, a small part of that city-block-sized personal "farm" must raise enough for each one of us and have a mite to spare for export to needy citizens of other lands. We are getting right down to a belt-tightening process, one that might be serious even for such a lavish land as ours, were it not that we possess provident and skillful farmers.

So every food consumer can regard the farm plant of this country much as he would any broad social service institution that serves and protects us. It is just as important as the post office, for there would be little need of a postal system in a starved and impoverished nation. It is fully as important as the railways or the airlines

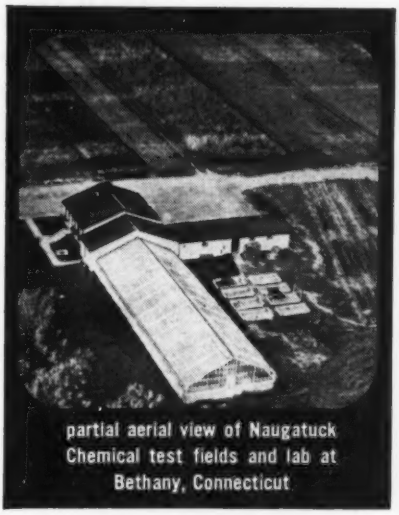
or the highways or the customs offices or the police departments. It is fully as valuable as the power facilities and the mines and the health departments, or as almost anything you can name that makes life easier and more secure.

Maybe you and I may not be here to see all this dream come true. Yet we have faith because faith is the substance of things hoped for—and in our own era it can be also called "the evidence of things seen"—(rather than of things not seen.) For with our own eyes we have seen and lived abundantly and cheerily in the midst of a degree of plenty and variety the like of which no nation has ever had.

We have seen the worst of eroded lands made fertile, the blackest of marshes turned to bounty, the thinnest of feeble sands changed to fertile fields of humus and organic matter; and we have seen the average production raised to unbelievable levels, while the masters of the flocks and herds have trebled their output of the protective foods which a strong nation must have to lead the world away from fear and want.

SO there is something of a challenge in this filling of the fifth plate. Practical farmers will say little one way or the other about it. It's their custom not to shout or give free rein to inmost thoughts. But you can bank on them to deliver. You may be sure they will adopt the better ways, find the sanest and quickest solutions, grasp the chief essentials of a problem, and then go to it quietly and thoroughly.

If I know America and its farmers, the fate of the fifth plate rests in good hands today. They always invited the preacher or the strolling peddler or the weary traveler to partake, and up in our old valley they always had a fifth plate stashed away—ready to be warmed and heaped high with viands, so that nobody would forget that the old farm was the fountainhead of abundance—as well as the abiding place for decency and peace.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Landlady—"Did you knock on that traveling man's door and wake him up as I told you to do?"

New Maid (fresh from the country)—"Yes'm. But he didn't wake up, so I finally had to go in and shake him."

Landlady—"Good heavens, don't you know better than to ever go into a traveling salesman's room?"

New Maid—"Yes'm. I do now!"

* * *

The naughty little boy was shut up in the clothes closet. After a long while, the stern but anxious mother opened the door and said, "You're so quiet, Johnny. What are you doing?"

From the corner came the cold reply, "I thpit on your new hat and your dress and your thatin thlipperth, and now I'm waitin' for more thpit!"

* * *

"Say, what's that crawling on the wall?"

"Ladybug."

"Gad! What eyesight!"

* * *

A negro spinster of uncertain years decided at long last to join the Baptist Church. As the deacons plunged her into the river the first time she gasped, "I believe." The second time she chattered, "I believe." A third time, gulping for air, she spluttered, "I believe." One of the elders interposed, "You believe what, sister?" She eyed him savagely, "I believe you stinkers are trying to drown me."

The beautiful girl and the honorable man, sole survivors of a wreck; he had saved her, managed to get on a desert island and there for three long years they lived in hope—she growing daily more beautiful, he daily more honorable. At last she could stand it no longer. "It looks like we are going to spend the rest of our lives here," she said coyly one day. "Don't you think we might—might be more friendly?" "All right," he answered eagerly. "I've been longing to ask you if you'd care to play two-handed bridge with a set of cards I've made out of palm leaves."

* * *

A plumber, doing some work for a friend customer, grew expansive about his family. "My daughter's a fine girl," he said proudly. "She graduated from college last year and now she has a job at $35 a week. That's a pretty good salary *for an educated person.*"

* * *

A tourist in the Ozarks called to the old woman sitting on the porch, "How far is it to the nearest town?"

"Pa figgers it's about 10 miles thar and about 12 back," she answered. "Which is on account of him walking straighter goin' than comin'."

* * *

A Colorado judge advises husbands to turn nagging wives over their knees and spank them. Some husbands forget all about spanking when they get wives turned over their knees.

Fertilizer Borates

TWO TYPES ARE OFFERED

1 FERTILIZER BORATE, HIGH GRADE

a sodium borate ore concentrate containing the equivalent of 120% Borax.

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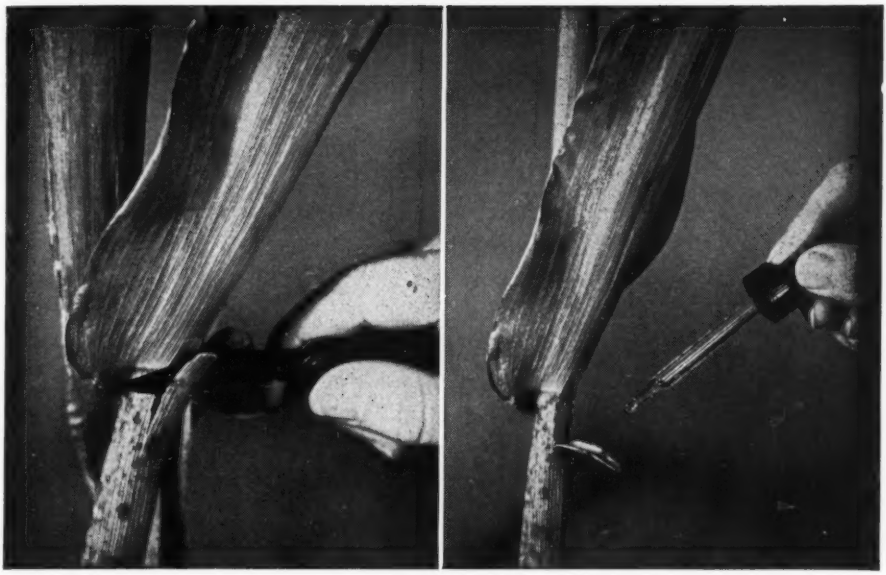

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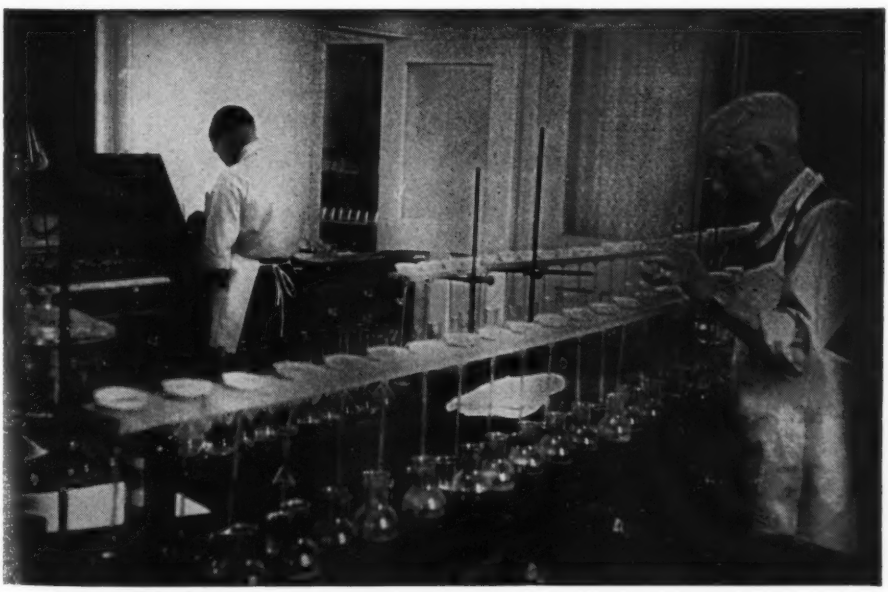

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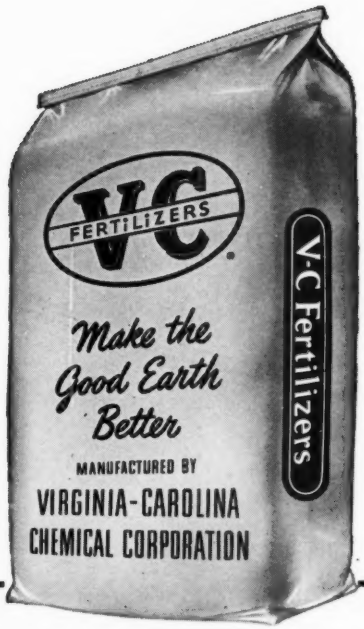

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